

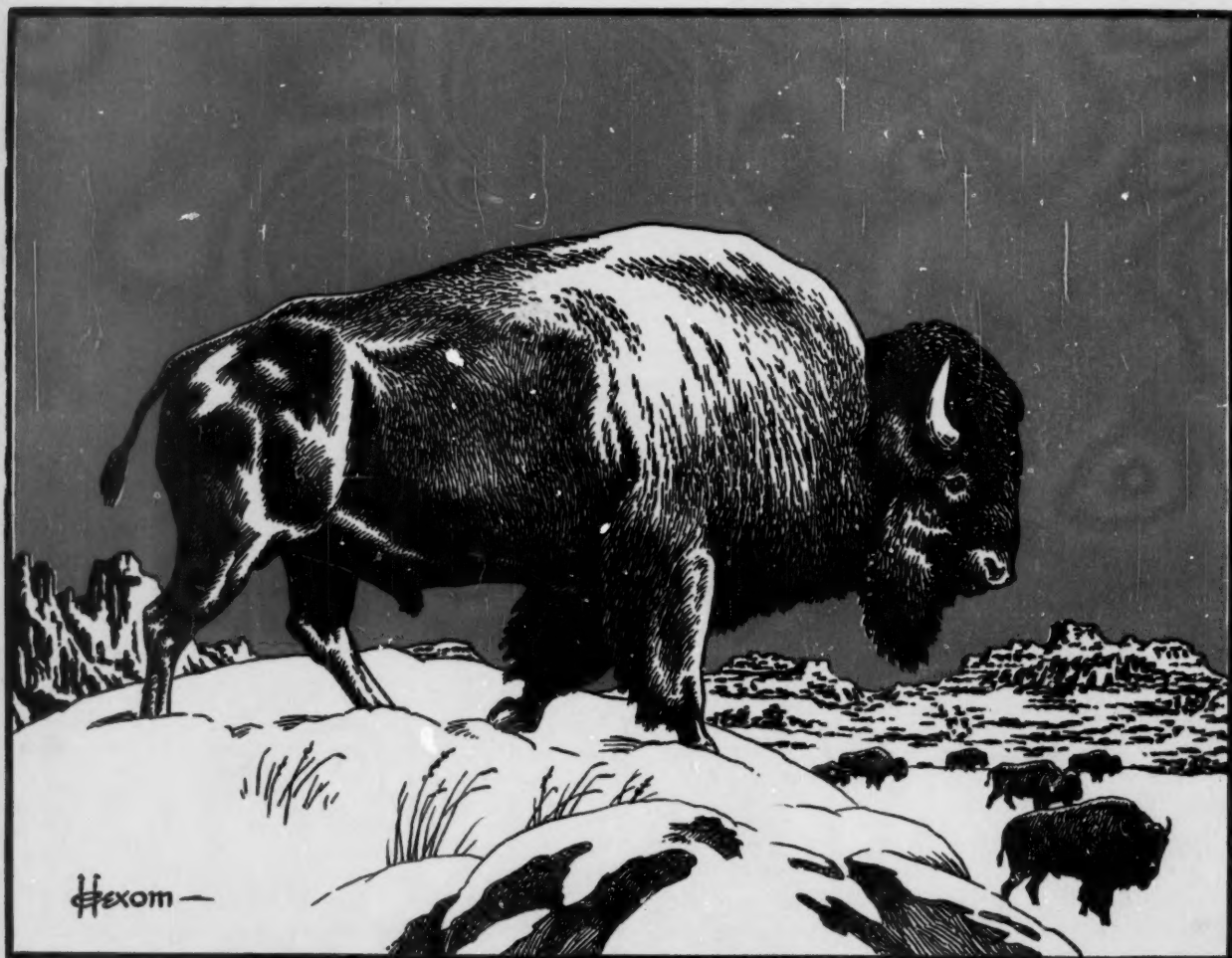
Nature *Magazine*

JANUARY

1959

VOLUME 52 NUMBER 1

50 Cents



Keep A Year's Issues of NATURE MAGAZINE in this Handsome Binder

"Where's the latest copy of Nature Magazine?" How often you have heard that question! And how often an answer like this: "Look on the chair . . . over in the corner!" Like as not, the much desired copy will turn up under the cushion in the window seat. And great will be the lament at torn pages and creased pictures.

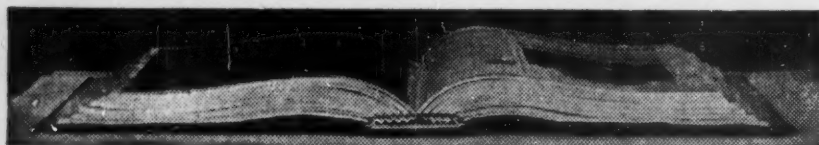
Unlike most magazines, Nature Magazine is the sort you want to keep. Naturally issues accumulate. There's an easy solution to the problem of mislaid copies, unsightly disorganized piles of magazines. Get one of these binders specially prepared for Nature Magazine.

Just slip in the copies of Nature Magazine as they arrive. Snap them in with the little unbreakable hooked wire. This binding device while light is strong and sturdy, guaranteed to withstand all ordinary usage. The copies may be removed as they are inserted. At the end of the year, remove the year's copies and have them bound. Your binder is then ready to serve another year, accommodating each issue as it arrives.



Always Protected and Right at Hand

This binder looks and handles like a book. It is a bound book in every respect except that you snap the magazines in the cover one at a time. It opens flat as a bound book, which makes it easy to handle and to read. It keeps the magazines handy for a year — or as long as you wish to retain them in the binder. Meanwhile the contents are protected from handling, tearing and from being mislaid or carried away. The binder is finely grained, dark green, gold embossed . . . a handsome addition to desk or library.



← Open Flat
like a Book

This Deluxe Binder Only \$3.00

Personalize Your Volumes
(Extra)
Your name in Gold 80c
Year or Vol. number 50c
Both for 1.20

Send for your binder today before this copy of your magazine gets mislaid. Satisfaction guaranteed or your money refunded. Use the coupon here or, if you prefer, write us your order so as to avoid cutting the magazine.

AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., N. W.
Washington 6, D. C.

Send me _____ of your De Luxe Binders for NATURE
MAGAZINE, for which I enclose (check, P.O. Money Order)
for \$ _____

Name _____

Street and No. _____

City and State _____

NEW YEAR SALE

10 to 60%

REDUCTION ON ALL
SCIENTIFIC BOOKS

5636. LOVE IN THE SOUTH SEAS. By Bengt Danielson, anthropologist on the Kon-Tiki voyage. A complete, accurate, frankly written account of the family and sex life of the Polynesians, that deals with sex instruction, marriage customs, sexual freedom and prohibitions, attitude toward nudity, abortion and virginity, and the basic concepts of a people to whom the sexual act is as natural as eating and drinking. Photos. Pub. at \$4.00. **Only 3.25**

4044. NEW WORLD FAMILY ENCYCLOPEDIA. Ed. by Wm. F. Hendelson. New, authoritative, handsomely-bound, 20 volume encyclopedia—up-to-date through 1954; excellently illustrated (4000 pictures, full-scale coverage by reliable experts; 5,000,000 words, 30,000 subjects, charts, maps, etc.; 5758 pages. Bound in attractive, custom-made Rex quality cloth, gold-stamped and embossed. Each volume 5-5/8" x 8 3/4". Pub. at \$59.50. **A limited quantity available at only 19.95**

5168. THE BOOK OF THE MOUNTAINS. Ed. by A. C. Spectorsky. Here is a most splendid book, devoted entirely to those great ranges of snow-capped giants that straddle our globe; a volume revealing the total sense of the mountain world and man's relation to it. Here is mountaineering in every aspect, as well as the wonder, secrets and beauty of mountains, in over 80 articles, 490 pages, and nearly 100 breathtaking illustrations. 7" x 10". Pub. at \$12.50. **Only 7.95**

B1068. GAS TURBINES AND JET PROPULSION. By G. Geoffrey Smith, M. B. E. Covering every phase of the subject, this book describes the achievement and problems of all the major countries in this field. Hundreds of illustrations and charts. Indexed. Pub. at \$7.50. **Only \$3.20**

6135. THE COLUMBUS ATLAS. By John Bartholomew. Prepared by one of the world's finest cartographers, this new regional atlas of the world contains 160 pages of fully colored maps and an index of nearly 50,000 place names, with populations, keyed to the maps. All the plates have been hand-made by a highly intricate special color process, and their clarity, precision and complete accuracy make this atlas invaluable for everyone wishing to keep up with the complex affairs of today's world. 8 1/2" x 11". Pub. at \$10.00. **Only 8.98**

4786. IN SEARCH OF ADAM. By Herbert Wendt. The greatest detective story of all time—the search for the truth about the origins of MAN in the mists of the unrecorded past. Here, in one 550-page volume, is everything that is known about the kinship between humans and apes, the "missing link," and the mysterious lost races who may have been our first human ancestors. 48 pages of photos. Pub. at \$6.50. **Only 5.00**

5830. IN BALLOON & BATHYSCAPHE. By Prof. Auguste Piccard. The world-famous scientist-explorer takes the reader from the stratosphere to the floor of the ocean and explains in popular terms the difficulties that had to be surmounted in achieving mobility at fantastic heights and depths. Photos, diagrams and technical appendices. **Special 4.00**

4703. EXTRAORDINARY POPULAR DELUSIONS and the Madness of Crowds. By Charles Mackay. Intro. by Bernard Baruch. A classic work describing in vivid detail great delusions that disastrously affected whole peoples and nations: the Witch Mania, the Tulip Madness, "magnetic healing," financial hoaxes, belief in alchemy, divination and the end of the world, etc. A remarkable book that Baruch said had saved him millions of dollars. Illus. Over 700 pp. Pub. at \$7.00. **Only 6.00**

B1001. A COMPARATIVE PATHOLOGY OF THE NEUROSES. By Ludwig Eidelberg. By comparing the various neuroses, the author examines the problem of the choice of neurosis and the attitude of the total personality to various formations-neurotic symptoms, character traits, perversions. Pub. at \$4.50. **Only 3.98**

6262. LIGHTEST AFRICA. By F. Spenser Chapman. The famed naturalist and his family travel for nearly a year in a caravan over 17,000 miles of Africa. Everyday experiences include giraffes, hippos, rhinos, and lions; Pygmies hunting in the Ituri Forest; Victoria Falls and Kilimanjaro—a list as long as it is exotic. 60 enthralling photographs half of them in full color. Pub. at \$5.00. **Only 4.39**

B1069. ATOMS FOR PEACE. By David O. Woodbury. Everything you want to know about atomic energy—What is Energy?—Experiments—Atomic Energy Is Born—How the Bomb Works—What is a Reactor?—New Energy for Underdeveloped Nations—Atomic Power in Space, At Sea, On Wheels—Radiation and Cancer, etc. Indexed. Pub. at \$3.50. **Only \$3.20**

6369. THE SEARCH WITHIN: The Inner Experiences of a Psychoanalyst. By Theodore Reik. Unsparring in its revelation of personal detail, courageous in its observations, absorbing, witty and illuminating, this is a frank synthesis of Reik's life, training and philosophy, his long association with Freud, etc., drawn from recent, unpublished material as well as such famous works as "The Secret Self" and "Listening With the Third Ear." 670 pp. Pub. at \$7.50. **Only 5.60**

6859. THE ENGINEERING PROFESSION. By Theodore J. Hoover and John C. Lounsbury. Revised edition of a standard work that explains who is an engineer, defines engineering, describes the nature and character of the field and discusses salaries. "Everybody interested in the engineering profession should have a copy of this book."—The Professional Engineer. Charts and diagrams, 486 pp. Pub. at \$7.50. **Only 3.98**

6128. THE BLUE CONTINENT. By Folco Quilici. A first-hand account of adventure and discovery beneath the Red Sea, and of the daring men and women who have explored and expanded the wondrous world of a new continent, using weapons as old as curare and as new as jet propulsion. Illustrated with more than 60 remarkable photographs, including 26 in full color. Pub. at \$5.00. **Only 3.98**

B1002. THE INVISIBLE CURTAIN. By Joseph Anthony. The life stories and personalities of seven victims of neurosis, each intellectually capable but emotionally crippled, each fighting the curative process as hard as he or she sought it. Based on the psychoanalytic cases of Louis Montgomery, the world famous analyst. Pub. at \$3.50. **Only 3.11**

4129. WILD FLOWERS OF AMERICA. Ed. by H. W. Rickett, 400 flowers in full color—from paintings by Mary Vaux Walcott, with additional paintings by Dorothy Falcon Platt—shown actual size in beautiful true-to-life full color, with detailed descriptions and full information on family geographical range, environment in which they are found, etc. The encyclopedic work is based on an authoritative publication of the Smithsonian Institution. Pub. at \$10.00. **Only 5.95**

B1065. THE WORLD OF NIGHT. By Lorus and Margery Milne. While the rest of the world sleeps, the life of the night creature begins. Birds, mammals, insects, reptiles—enacting the fascinating drama of nature. Pub. at \$3.75. **Only \$2.98**

B1003. TRAINING DOGS. By Konrad Most. This famous work, by the international authority has long been accepted as standard for both professional trainers and the dog owner. Deals in detail with Theory of Training, as well as Practical Training. Covers such aspects as Action, Abstinence Compulsion Inducements Down and Recall, Defense Water Work etc. Illustrated throughout with photographs and drawings. Pub. at \$5.00. **Only 3.49**

6259. THE SPLENDOR THAT WAS EGYPT. By Dr. Margaret Murray, F.S.A., F.R.A.I. A comprehensive, colorful survey of the grandeur that was Egypt, covering both its history and prehistory, its social conditions, religion, arts and sciences, language and literature. End-paper maps; over 200 illustrations in line, halftone, color. Pub. at \$10.00. **Only 7.98**

B1058. DEAD TOWNS AND LIVING MEN. By Sir Leonard Woolley. A world famous archaeologist and discoverer of the treasures of Ur, tells about his work in the Dead Cities of Egypt, Syria and Italy with emphasis on the mysteries of Arabia, and the hundreds of personalities like T. E. Lawrence, Ibrahim Pasha, Busrawi Agha, etc. 26 photographs. Pub. at \$6.00. **Only \$3.95**

6397. ANOMALIES AND CURIOSITIES OF MEDICINE. By George M. Gould, M.D. & Walter L. Pyle, M.D. An encyclopedic collection of rare and extraordinary cases, and of the most striking instances of abnormality in all branches of medicine and surgery, derived from an exhaustive research of medical literature from its origin to the present, abstracted, annotated and indexed. 12 half-tone plates & 295 illustrations in the text. 382 pp. Pub. at \$12.50. **Only 8.98**

4850. FIELD BOOK OF NORTH AMERICAN MAMMALS. By H. E. Anthony. From the swift night-runners that stalk the snowbound timberlands to the animals that fight for life in our hot desert-lands—this invaluable book contains descriptions of every known mammal north of the Rio Grande. 32 full-color plates; over 200 black-and-white illustrations. 644 pp. Pub. at \$6.00. **Only 3.95**

6282. New Concepts in Modern Psychology: GESTALT PSYCHOLOGY. By Dr. Wolfgang Kohler. This important book, now available in a completely revised edition, explores the existing schools of psychological thought and provides a starting new approach to the study of the mind. **Special 3.98**

6249. THE CHILDREN'S ILLUSTRATED ENCYCLOPAEDIA OF GENERAL KNOWLEDGE. Compiled by 13 expert contributors. This new and lavishly illustrated Encyclopaedia for children up to sixteen and seventeen is a reference book for practically every topic of general knowledge. Nearly 5,000 separate alphabetical entries have been divided into ten self-contained sections. "It should be in every family where there are children—with parents who must answer questions."—Daniel A. Poling in the Christian Herald. 480 pp. **Special 6.98**

6260. THE CONQUEST OF EVEREST. By Sir John Hunt. The celebrated account of Man's conquest of the highest mountain on Earth. Many photographs and drawings. Pub. at \$6.00. **Only 3.95**

4563. THE "THINK CLEARLY!" SERIES. A 10-volume home-study course in logic and clear-thinking showing how you can utilize these vital mental tools in everyday life. 10 softbound books cover scientific and efficient thinking, keys to rapid learning, etc. Nearly 500 pp. Illus. **The entire set, special 3.00**

B1049. PURSUIT OF AN ISLAND. By Julian Mockford. Lovers of the exotic and esoteric will thrill to the adventures of the author in his search for his "Isle of Happiness." Illustrated with photos. Pub. at \$3.00. **Only \$1.98**

6239. NEW WAYS TO BETTER SIGHT. By Dr. Harris Gruman. Everything you need to know about your eyesight its improvement and retention. Latest information on improving sight after forty, the visual effects of television, eye exercises, etc. Illus. Pub. at \$3.00. **Only 1.98**

B1004. WHERE WINTER NEVER COMES. By Marston Bates. The author of "THE NATURE OF NATURAL HISTORY" tells about the beauty of life in the tropics as well as the possible difficulties. He describes places, climate, customs, food and social background. 35 illustrations. Pub. at \$3.50. **Only 2.95**

6139. BIRDS' NESTS OF THE WEST: A Field Guide. By Richard Headstrom. This book shows you how to make the nest you find with the bird that built it; includes over 400 birds of the U. S. west of the 100th meridian. Illus. Pub. at \$3.00. **Only 1.98**

B1047. FORBIDDEN LANDS. By Gordon Cooper. The author describes the remote and exotic parts of the world which have not been tamed by our civilization. The strange, wild tribes of North Burma, Formosa, Africa, Australia, New Guinea, etc. Illus. with photographs. Pub. at \$4.75. **Only \$3.68**

B1005. THROUGH ARCTIC HURRICANES. Hans G. Prager. A true story of the sea. A newspaperman and a cameraman, together, paint this vivid picture of one of the worst hurricanes ever encountered by the Fishery Protection Ship. They tell of the fleet doctor's hazardous trips by rubber dinghy to care for the sick; the wonderful Arctic skies aflame with Northern Lights; of the scientific equipment and data that make all this possible. Illustrated with photos, charts and maps. Pub. at \$5.00. **Only 2.95**

B1077. THE FUNDAMENTAL PRINCIPLES OF HYPNOSIS. By Stanley L. Krebs. Introduction by Dr. Milton V. Kline. The clearest and most concise work on hypnosis and hypnotic methods. Pub. at \$3.00. **Only \$2.60**

OLIVER GARFIELD Co., Inc., Dept. NT-19, 108 East 16th Street, New York 3, N. Y.

Please send me Postpaid the titles I have circled (add 35c postage and handling on orders under \$5.00):

5536 — 4044 — 5168 — 5934 — 6135 — 4786 — 5830 — 4703 — B1001 — 6262 — 5947 — 6369 — 5859 — 6128 — B1002 — 4129 — 5796 — B1003 — 6259
6153 — 6397 — 4850 — 6282 — 6249 — 6260 — 4563 — 6180 — 6239 — B1004 — 6139 — 6137 — B1005 — 5331

NAME Address City State

Amount Enclosed (Minimum Order \$3.00) Do NOT Send Cash—Use Checks or M.O.

MENTION *Nature Magazine* WHEN ANSWERING ADVERTISEMENTS

Nature Magazine

JANUARY, 1959 VOL. 52 NO. 1

Published by the **AMERICAN NATURE ASSOCIATION** to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America

IN THIS ISSUE

Bison.....	Cover Hexom
Nature in Print.....	Howard Zahniser 4
Contents Noted.....	R. W. W. 7
The Hundred Birds.....	Mabel Irene Huggins 8
Outpost of the Arctic.....	Paul Mason Tilden 13
Cuba's Royal Palm Climbers.....	W. H. Hodge 17
Prelude (Poem).....	Jacob C. Solovay 18
A Sea Giant Goes to Harvard.....	Alden S. Wood 19
Wild Stallion (Poem).....	Alma Robison Higbee 20
The Termite's Place in Nature.....	Max Carasso 21

Requiem For A Gentle Man (Poem).....	Elma Dean 24
Turtles.....	E. Laurence Palmer 25
Uncontrollable "Control".....	Marguerite Angelo Smelser 33
Quaker City "Herps".....	Richard A. Cleveland 41
The Heavens in 1959.....	Simone Daro Gossner 44
Sic Transit Gloria (Poem).....	A. Kulik 45
Nature in the School.....	E. Laurence Palmer 46
The Nature Camera.....	Edna Hoffman Evans 48
Nature in Rock and Mineral.....	Paul Mason Tilden 51
Nature and the Microscope.....	Julian D. Corrington 54

THE ASSOCIATION

President	RICHARD W. WESTWOOD.....	Washington, D. C.
Vice-President	HARRY E. RADCLIFFE.....	Washington, D. C.
Secretary-Treasurer	JAMES A. O'HEARN.....	Sea Girt, N. J.
Director, Nature Education	DR. E. LAURENCE PALMER.....	Cornell University, N. Y.
Director, Public Motivation Study	DR. THOMAS F. JORDAN.....	Tucson, Arizona
President Emeritus	ARTHUR NEWTON PACK.....	Tucson, Arizona

SCIENTIFIC CONSULTING BOARD

DR. WALDO L. SCHMITT	Retired Head Curator, Zoology, U. S. National Museum
DR. HARRY C. OBERHOLSER	Retired Ornithologist, U. S. Fish and Wildlife Service
W. L. McATEE	Retired Biologist, U. S. Fish and Wildlife Service
DR. PAUL BARTSCH	Retired Curator of Mollusks, U. S. National Museum
DR. EDGAR T. WHERRY	Wild Flower Preservation Society
DR. WILLIAM M. MANN	Retired Director, National Zoological Park
DR. W. H. ANDERSON	Entomologist, U. S. National Museum

THE MAGAZINE

RICHARD W. WESTWOOD.....	Editor
PAUL MASON TILDEN.....	Assistant Editor
JULIAN D. CORRINGTON.....	Microscopy Editor
SIMONE DARO GOSSNER.....	Astronomy Editor
E. LAURENCE PALMER.....	School Editor
HOWARD ZAHNISER.....	Book Editor
EDNA HOFFMAN EVANS.....	Photography Editor
RUTH BACHMAN.....	Poetry Editor
HARRY E. RADCLIFFE.....	Business Manager
LAURENCE E. CROSBY.....	Advertising Manager
LAURENCE LUSTIG.....	Art Consultant

ADVERTISING OFFICES

New York 71-4673 Delafield Ave. Washington 6-1214 16th St., N.W.
Kingsbridge 8-5602. District 7-3259

SUBSCRIPTION RATE

NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D.C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3, 1917, and February 28, 1925. U.S. and Canada one year, \$5; foreign, \$5.50 extra; two years, \$9; life, \$100.

Publication and Editorial Office, 1214 16th Street, N. W., Washington 6, D. C. Additional office of publication, Easton, Pa.

Copyright, 1958 by American Nature Association, Title Registered U. S. Patent Office. Printed in the United States.

Nature Magazine, past and present, is indexed in The Reader's Guide in your public library.

Passenger-Carrying FREIGHTERS Are the Secret of Low Cost Travel

Yes, for no more than you'd spend at a resort, you can take a never-to-be-forgotten cruise to Rio and Buenos Aires. Or through the West Indies or along the St. Lawrence River to French Canada. In fact, trips to almost everywhere are within your means.

And what accommodations you get; large rooms with beds (not bunks), probably a private bath, lots of good food and plenty of relaxation as you speed from port to port.

Depending upon how fast you want to go, a round the world cruise can be yours for as little as \$250-\$300 a month. And there are shorter trips. Fast, uncrowded voyages to England, France, the Mediterranean; two or three week vacations up and down the Pacific Coast or elsewhere. Name the port and the chances are you can find it listed in *Travel Routes Around the World*. This is the book that names the lines, tells where they go, how much they charge, briefly describes accommodations. Hundreds of thousands of travelers all over the world swear by it. Travel editors and travel writers say "To learn how to travel for as little as you'd spend at a resort get *Travel Routes Around the World*."

It's yours for just \$1, and the big 136-page 1959 edition includes practically every passenger carrying service starting from or going to New York, Canada, New Orleans, the Pacific Coast, Mexico, South America, England, France, the Mediterranean, Africa, the Indies, Australia, the South Seas, Japan, Hawaii, etc. There's a whole section called "How to See the World at Low Cost," plus pages and pages of maps.

A big \$1 worth, especially as it can open the way to more travel than you ever thought possible. For your copy, simply fill out coupon.

Bargain Paradises Of the World

Do you know where to find an island right near the U. S. so nearly like Tahiti in appearance, beauty, and color even the natives say it was made from a rain-bow? (And that costs here are so low you can not only reach it but also stay a while for hardly more than you'd spend at a resort in the U. S.?)

Do you know where to find the world's best mountain hideaways or its most dazzling surf-washed coastal resorts, where even today you can live for a song?

Do you know where it costs less to spend a while, the surroundings are pleasant, and the climate well high perfect in such places as Mexico, the West Indies, Peru, France, along the Mediterranean, and in the world's other low cost wonderlands?

Or if you've thought of more distant places, do you know which of the South Sea Islands are as unspoiled today as in Conrad's day? Or which is the one spot world travelers call the most beautiful place on earth, where two can live in sheer luxury, with a retinue of servants for only \$175 a month?

Bargain Paradises of the World, a big book with about 100 photos and 4 maps, proves that if you can afford a vacation in the U. S., the rest of the world is closer than you think. Authors Norman D. Ford and William Redgrave, honorary vice presidents of the British Globe Trotters Club, show that the American dollar is respected all over the world, and buys a lot more than you'd give it credit for.

Yes, if you're planning to retire, this book shows that you can live for months on end in the world's wonderlands for hardly more than you'd spend for a few months at home. Or if you've dreamed of taking time out for a real rest, this book shows how you can afford it.

In any case, when it can cost as little as \$24.50 from the U. S. border to reach some of the world's Bargain Paradises, it's time you learned how much you can do on the money you've got. Send now for **Bargain Paradises of the World**. Price \$1.50. Use coupon to order.

Round the World on a Shoestring

If you know the seldom-advertised ways of reaching foreign countries, you don't need fantastic sums of money in order to travel. You could spend \$500-\$1000 on a one-way luxury steamer to Buenos Aires—but do you know you can travel all the way to Argentina through colorful Mexico, the Andes, Peru, etc. by bus and rail for just \$132 in fares?

You can spend \$5000 on a luxury cruise around the world. But do you know you can travel around the world via deluxe freighter for only a fourth the cost—and that there are almost a dozen other round the world routings for under \$1000?

There are two ways to travel—like a tourist, who spends a lot, or like a traveler, who knows all the ways to reach his destination economically, comfortably, and while seeing the most.

Norman Ford's big new guide *How to Travel Without Being Rich* gives you the traveler's picture of the world showing you the lower cost, comfortable ways to practically any part of the world. Page after page reveals the ship, rail, bus, airplane and other routings that save you money and open the world to you.

What do you want to do? Explore the West Indies? This is the guide that tells you how to see them like an old time resident who knows all the tricks of how to make one dollar do the work of two. Visit Mexico? This is the guide that tells you the low cost ways of reaching the sights (how 56¢ takes you via 8-passenger automobile as far as those not-in-the-know pay \$5.60 to reach). Roam around South America? Europe? Any other part of the world? This is the guide that tells you where and how to go at prices you can really afford.

If you've ever wanted to travel, prove now, once and for all, that travel is within your reach. Send now for *How to Travel Without Being Rich*. It's a big book, with over 75,000 words, filled with facts, prices, and routings, and it's yours for only \$1.50. Even one little hint can save you this sum several times over.

Special Offer: all three books above—*Travel Routes Around the World*, *Bargain Paradises of the World*, and *How to Travel Without Being Rich*—for \$3.

Where Will You Go in Florida?

If You Want a Vacation You Can Afford?

Florida needn't be expensive—not if you know just where to go for whatever you seek in Florida. And if there's any man who can give you that facts you want it's Norman Ford, founder of the world-famous Globetrotters Club. (Yes, Florida is his home whenever he isn't traveling.)

His big book, **Norman Ford's Florida**, tells you, first of all, road by road, mile by mile, everything you'll find in Florida, whether you're on vacation, or looking over job, business, real estate, or retirement prospects.

Always, he names the hotels, motels, and restaurants where you can stop for the best accommodations and meals at the price you want to pay. For that longer vacation, if you let Norman Ford guide you, you'll find a real "paradise"—just the spot which has everything you want.

Of course, there's much more to this big book.

If you want a job or a home in Florida, Norman Ford tells you just where to head. If you want to retire on a small income, Norman Ford tells you where life in Florida is pleasant on a small income.

Yes, no matter what you seek in Florida—whether you want to retire, vacation, get a job, buy a home, or start a business, **Norman Ford's Florida** gives you the facts you need to find exactly what you want. Yet this book with plenty of maps and well over 100,000 words sells for only \$2—only a fraction of the money you'd spend needlessly if you went to Florida blind.

For your copy, fill out coupon now.

Where to Retire or Vacation

at what look like prewar prices—and
where no one ever heard of nerves or worries

These Are America's Own Bargain Paradises

Norman Ford's new book *Off-the-Beaten Path* names the really low cost Florida retirement and vacationing towns, the best values in Texas, the Southwest, California, the South and East, Canada—and a dozen other areas which the crowds have not yet discovered.

—Fabulous places like that undiscovered region where winters are as warm and sunny as Miami Beach yet costs can be two-thirds less. Or that island that looks like Hawaii yet is 2,000 miles nearer (no expensive sea or air trip to get there). Or those many other low-cost exquisitely beautiful spots all over the United States and Canada which visitors in-a-hurry overlook (so costs are low and stay low).

Every page of *Off-the-Beaten Path* opens a different kind of vacationing or retirement paradise which you can afford—places as glamorous as far-off countries yet every one of them located right near at hand. Like these:

- France's only remaining outpost in this part of the world—completely surrounded by Canadian territory. . . or a village more Scottish than Scotland. . . or age-old Spanish hamlets right in our own U. S., where no one ever heard of nervous tension or the worries of modern day life.
- Resort villages where visitors come by the score, so you always meet new people. . . (but they never come by the thousands to raise prices or crowd you out).
- That remarkable town where a fee of 3¢ a day gives you an almost endless round of barbecues, musicals, picnics, pot luck suppers, smorgasbord dinners and a fine arts program. That southern island first discovered by millionaires who had all the world to roam in. . . and now their hideaways are open to anyone who knows where to find them.

You read of island paradises aplenty in the United States and Canada, of art colonies (artists search for picturesque locations where costs are low), of areas with almost a perfect climate or with flowers on every side. Here are the real U.S.A.-brand Shangri-Las made for the man or woman who's had enough of crowds. Here, too, are unspoiled seashore villages, tropic-like islands, and dozens of other spots just about perfect for your retirement or vacation at some of the lowest prices you've heard of since the gone-for-ever prewar days. They're all in the United States and Canada, and for good measure you also read about the low-cost paradises in Hawaii, the Virgin Islands and Puerto Rico.

Off-the-Beaten Path is a big book filled with facts that open the way to freedom from tension and a vacation or retirement you can really afford. About 100,000 words and plenty of pictures. Yet it costs only \$2.

Mail to HARIAN PUBLICATIONS, 95 King St., Greenlawn (Long Island), New York

I have enclosed \$..... (cash, check or money order). Please send me the books checked below. You will refund my money if I am not satisfied.

- ☐ TRAVEL ROUTES AROUND THE WORLD—(the traveler's directory of passenger-carrying freighters). \$1.
- ☐ BARGAIN PARADISES OF THE WORLD. \$1.50.
- ☐ HOW TO TRAVEL WITHOUT BEING RICH. \$1.50.
- ☐ SPECIAL OFFER: *Travel Routes Around the World*, *Bargain Paradises of the World*, and *How to Travel Without Being Rich*—all three (\$4 value) for \$3.
- ☐ NORMAN FORD'S FLORIDA. \$2.
- ☐ OFF-THE-BEATEN PATH . . . America's own bargain Paradises \$2.
- ☐ SPECIAL OFFER: All five books listed above for only \$6.

Print Name

Street Address

City..... Zone..... State.....

Nature IN PRINT

By HOWARD ZAHNISER

Of Many Animals

IN THE CHARMING BOOK STORE THAT Agnes Harmanson conducts in the

French Quarter of New Orleans, at 333 Royal Street—dividing her time between her smiling accommodation of the many visitors who sometimes become customers and her fascination with a television set off to her left at a closet entrance—I recently browsed through many old volumes and came away the owner of a century-old pair of volumes entitled *A History of the Earth and Animated Nature*, by Oliver Goldsmith. With an *Introductory View of the Animal Kingdom* by Baron Cuvier; *Copious Notes of Discoveries in Natural History*, and a *Life of the Author*; By Washington Irving.

Dr. Samuel Johnson in his Westminster Abbey epitaph called Oliver Goldsmith a natural philosopher, as well as poet and historian, and praised him for leaving "no species of writing untouched or unadorned by his pen." For me, at a distance in time and space, his *Animated Nature* has indeed adorned a "species of writing" I much enjoy. It has added a charm to a row of volumes that certainly rival his for wealth of information and accuracy of representation in illustration. Nor is the charm solely that of a century-old quaintness of expression, or of the lithographed and colored illustrations. Also engaging is a reflection, a philosophizing, a subjective approach.

His subject, he reflects, for example, has a dual object—discovering, ascertaining, and naming the various productions of Nature but also "describing the properties, manners, and relations which they bear to us, and to each other." The first, he comments, is "systematical, dry, mechanical, and incomplete," but the second is "more amusing, exhibits new pictures to the imagination, and improves our relish for existence, by widening the prospect of nature around us."

Could Oliver Goldsmith have enjoyed Alexander B. Klots's large volume on *The World of Butterflies and Moths*, he might have found the discovery and naming much less dry, mechanical, and incomplete—so vividly illustrated with photographs in color strikingly reproduced. Richer thus in fact and particulars, the new volume also is an introduction of "the reader to these insects as living members of their environmental communities," fulfilling an expectation of descriptions of "properties, manners, and relations which they bear to us, and to each other." In fact, some of Alexander Klots's writing is as fascinating as the brilliant photographs, and the world of butterflies and moths—our world, too—has a beauty and aliveness of which the one who reads and beholds this book is newly aware.

Outstanding photography

This is magnificently true also of the world of birds revealed and illuminated anew by E. Thomas Gilliard's large, 400-page volume on *Living Birds of the World*, illustrated with outstanding achievements in modern bird photography—more than 200 of them reproduced in color. "Birds," Dr. Gilliard suggests, "provide a 'window' through which both laymen and scientists can learn of their kinship to the rest of the animal kingdom." With his book he takes the reader to that window, reveals with photographs the many species of birds, mostly in the wild at their nests and in their wild activities, and then with his text describes and reports the facts that "bird-watchers have discovered for science." It is an interesting text and an enlarging experience to survey thus in a single volume the whole class Aves as it now lives on the Earth.

Detailed volumes of the bird life of particular geographic areas are, of course, still being prepared. F. W. Frohawk has recently added a handy-size volume on *British Birds* with some 224 illustrations for identifica-

tion—more than 100 in color. These are illustrations reminiscent of the ones so many of us first carried into the field with us in Chester A. Reed's bird guides—most of them reproduced in about the same size as those in our pocket guides by Reed. "Few authors," says J. D. Macdonald of the British Museum, in a preface, "are more competent than the late F. W. Frohawk to provide a book of this nature, for he combined an intimate knowledge of birds in the field with an ability to depict their characteristics in pleasing and accurate drawings."

Of Indian animals

The artist-photographer of animals, Camilla Koffler—known to us simply as Ylla—who amazed and delighted us a few years ago with her magnificent photographs in *Animals in Africa*, went to India in 1954 and there over a period of some seven months obtained photographs that now almost live on the large pages of a volume entitled *Animals in India*. Many of the photographs, some reproduced in colors, are of birds in the wild and of lions, tigers, elephants, monkeys, too, but some of the pictures also are of the animals in the village settings of India—including a breath-taking view of the classic drama of cobra and mongoose fighting. Ylla's photography was tragically ended on this expedition as a fatal accident threw her from a jeep as she was photographing a country fair. Her volume is a brilliant memento of a great art, her own notes providing a text that enriches the reader's understanding and adds a personal note of interesting experience in a strange land.

Ylla was shocked by the killing she beheld as she accompanied hunting parties on the expedition for her photographs. "Poor, beautiful things, with glassy eyes, and soft paws," she exclaimed over the dead tiger, "very beautiful." She asked herself, in her notes, "What is the point to all this, really what is the point?" F. W. Frohawk also criticized "killing for pleasure" in comments on bird protection which concluded the introduction to his *British Birds*. "The self-styled sportsman," he wrote, "is gradually becoming obsolete," a process that he believed will be "hastened by common humanity." Ylla reflected: "Only if we approach animals innocently, only then, it seems to me, can we be fearless and free."

Such photographs as Ylla obtained, and such illustrations as those that adorn and illumine *The World of Butterflies and Moths* described by Alexander B. Klots and E. Thomas Gilliard's accounts of *Living Birds of the World*, are indeed making our experience of Nature through books more vivid and more meaningful than the best Oliver Goldsmith could offer his readers. The added wealth of facts that Alexander Klots and E. Thomas Gilliard can offer us is significant. The enlarged opportunity to understand our relationship to all life, "widening the prospect of nature around us," is perhaps even more meaningful.

Animals in India. Text and photographs by Ylla. Layout and design by Luc Bouchage. New York: Harper & Brothers. No date. 132 pp. (9 by 11½ in.), with 76 photographs, 22 reproduced in color—3 in black and white and 2 in colors extending entirely across two pages making a photograph 18 x 11½ in., one of these being a full-length photograph of a tiger. \$10.

British Birds. By F. W. Frohawk. New York: Abelard-Schuman Limited. 1958. 256 pp. (5¼ by 8½ in.) with preface by J. D. Macdonald, 224 drawings (104 of them on 31 plates in colors), glossaries, and index. \$5.

Living Birds of the World. By E. Thomas Gilliard. Garden City, N.Y.: Doubleday & Co. 1958. 400 pp. (8½ by 11½ in.) with 396 photographs (217 of them on 112 plates in colors), bibliography, and index. \$12.50.

The World of Butterflies and Moths. By Alexander B. Klots. New York, Toronto, London: McGraw-Hill Book Co. No date. 207 pp. (9 by 11½ in.) with end-paper drawings by Jean Norbert, 142 black-and-white photographs on 64 plates, 132 illustrations in colors on 24 plates, 21 text illustrations, bibliography, and index. \$15.

Reviews

Ebb and Flow

By Albert Defant. Ann Arbor, Michigan. 1958. University of Michigan Press. 121 pages. Illustrated. \$4.00.

Tides are extremely important phenomena and of world-wide significance and effect. In this small book

the author, noted oceanographer, tells the story of the tides of earth, air and water in a manner comprehensible to any intelligent reader.

The Ring-Necked Duck in the Northeast

By Howard L. Mendall, Orono, Maine. 1958. University of Maine Press. 320 pages. Illustrated. \$2.50.

The author of this book is associated with the Maine Cooperative Wildlife Research Unit, and this report on his studies is an important contribution to knowledge about this bird, *Aythya collaris*. It is of special interest to ornithologists and those charged with the administration of our migratory waterfowl species.

The Guide to Garden Flowers

By Norman Taylor. Boston. 1958. Houghton Mifflin Company. 315 pages. Illustrated in color and black and white. \$4.95.

There are 324 species of garden flowers illustrated in color, and 88 in black and white, in this book. This fact, together with an arrangement of the plants by color, provide the gardener with a notably helpful guide to the selection of inhabitants for the garden. The author seeks to make identification of garden flowers "as painless as possible" and to provide such cultural notes that growing these plants will be easy for all. He has attained his dual goal.

Briefly Noted

British Mammals. By Maurice Barton. New York. 1958. Oxford University Press. 64 pages. Illustrated. \$2.75. The seventh volume in the Oxford Visual Series. It covers British mammals generally and concisely.

The Changing Face of New England. By Betty Flanders Thomson. New York. 1958. The Macmillan Co. 188 pages. \$3.75. An extremely interesting discussion of why the landscapes of New England are what they are. A valuable book for any visitor to New England and an open sesame to appreciation of this lovely area.

Champion Dog Prince Tom. By Jean Fritz and Tom Clute. New York. 1958. Coward-McCann. 128 pages. Illustrated by Ernest Hart. \$2.95. Story of a blonde cocker spaniel and a national champion.

The Hermit of Crab Island. By Clara Baldwin. New York. 1958. Abingdon Press. 176 pages. Illustrated by Ray Campbell. \$2.50. A story for younger readers laid in the Gulf Coast locale.

"What's the distance modulus?

And the escape velocity from Saturn?

And the red shift?

And the solar carbon cycle?

And a Cepheid variable? And—"

Now that artificial satellites are routine . . . and moon rockets a reality . . . and space travel within reach, you can count on an ever-increasing demand for accurate, up-to-date information on astronomy. You can find over 2,200 vital facts fast with the new—

DICTIONARY OF ASTRONOMY AND ASTRONAUTICS

by Armand Spitz

Coordinator of
Visual Satellite Observations for the
Smithsonian Astrophysical Observatory

and Frank Gaynor

Author of *Encyclopedia of Atomic Energy*
& Contributing Editor to the *Encyclopedia Britannica*

Arranged in handy dictionary form and supplemented by numerous graphs and illustrations, here are concise definitions of every important term and concept relating to astronomy and astronautics. What kinds of instruments did Sputniks I and II contain? How long does it take Jupiter to go around the sun? How do radio telescopes operate? What is the half-life of an element? You can answer these and a thousand other queries rapidly and readily with this convenient, desk-sized ("x") dictionary.

N.B. Although primarily a reference book, the *Dictionary of Astronomy and Astronautics* is so complete (and so fascinating to read) that you'll find it a popular addition to your circulation shelf—a book more informative, up-to-date and interesting than most introductory works on astronomy and space travel. \$6.00

PHILOSOPHICAL LIBRARY

15 East 40th Street New York 16

Reviews

Field Guide to Reptiles and Amphibians

By Roger Conant. Boston. 1958. Houghton Mifflin Company. 366 pages. Illustrated in color and black and white by Isabell Hunt Conant. \$3.95.

This is the latest in the Peterson Field Guide Series, following the general plan of its predecessors. It is also the most complete and up-to-date guide to the reptiles and amphibians of Eastern North America. More than 1100 illustrations are supplied, some four hundred of these in full color. Introductory chapters cover general information, data on collecting equipment, information on care of live specimens and other essential material. There is an excellent bibliography, and distribution maps. Publication of this book brings the guides in this series to an even dozen, with two more in preparation.

Plants of Woodland and Wayside

By Su Zan Noguchi Swain. New York. 1958. Doubleday and Company. 57 pages. Illustrated by the author. \$2.95.

This large-size, attractively printed and illustrated book is designed to introduce beginners to the world of plants. Obviously, within its page limitations this book can do little more than that, but the objective is successfully accomplished by introduction to certain typical plants and to various areas of their growth.

The Book of Small Mammals

By Ted S. Pettit. New York. 1958. Doubleday and Company. 56 pages. Illustrated by G. Don Ray. \$2.95.

Through its introductory text and excellent illustration, this large-sized book opens the door to interest in the small mammal population of our country. The audience is the budding naturalist.

The Age of Reptiles

By Dorothy Shuttlesworth. New York. 1958. Doubleday and Company. 56 pages. Illustrated by Matthew Kalmenoff. \$2.50.

This is a dramatic introduction to life in prehistoric times. It is a general and sweeping picture but should serve to whet young appetites for knowledge of the spectacular reptiles that dominated the animal world for 140,000,000 years.



Max Carasso

OUR JANUARY AUTHORS

Mabel Irene Huggins, an employee in the design department of the Kansas State Highway Department, was for many years engaged in educational work in China. She is a resident of Topeka. . . Paul Mason Tilden is assistant editor of *Nature Magazine* . . . Walter Henricks Hodge is the head of the Department of Education and Research at Longwood Gardens in Kennett Square, Pennsylvania. Dr. Hodge, trained as a



Marguerite Smelser

professional botanist, has spent a considerable part of his life in botanical work as college teacher, field botanist or plant explorer both in this country and abroad. . . Alden S. Wood, native of Medford, Massachusetts, is a Boston editor and free-lance writer. . . Max Carasso is the vice-president of the Abalone Pest Control Service, Inc., of New York City; he is a writer on problems of industrial mobilization, economic development programming, business management, foreign investment—and bugs, adds our author. . . Marguerite Angelo Smelser, a native Californian, lives with her naturalist husband at the edge of the Audubon Warm Creek Wildlife Refuge (of which she was a co-founder) between San Bernardino, Redlands and Colton. Mrs. Smelser, an article writer and newspaper columnist, is the possessor of many years' background of Nature study, observation and research, and is a veteran of more than 10 years of active conservation and naturalist work. In 1956, Mrs. Smelser published a series of articles on the predatory animal control question which, gathered into booklet form, is being used in schools, libraries, and youth and Nature groups throughout the nation. . . Richard A. Cleveland, a resident of Malvern, Pennsylvania, is affiliated with the news department of station WFIL-TV, in Philadelphia.

Briefly Noted

Fishing America. By Edward A. Hamilton and Charles Preston. New York. 1958. Doubleday and Company. 128 pages. Illustrated in color and black and white. \$5.95. This is a primarily pictorial tour of some of the most adventurous and scenically exciting fishing spots in the United States and Canada.

Look for A Bird's Nest. By Robert Scharff. New York. 1958. G. P. Putnam's Sons. 96 pages. Illustrated by Valerie Swenson. \$2.75. More than sixty birds are considered in this discussion of nests.

The Beginner's Book of Astronomy. By John Sternig. New York. 1958. Robert M. McBride Co. 162 pages. Illustrated. \$3.75. A book for young people and adults seeking knowledge of the universe.

Fridtjof Nansen. By Francis Noel-Baker. New York. 1958. G. P. Putnam's Sons. 126 pages. Illustrated by Robert Doremus. \$2.00. A brief and popular biography of the explorer of the Arctic.

Philosophy of Atomic Physics. By Joseph Mudry. New York. 1958. Philosophical Library. 136 pages. \$3.75. The author promulgates a new doctrine treating with the dynamics of a philosophical scheme.

Outdoor Rambles. By Stuart L. Thompson. New York. 1958. Longmans, Green and Co. 147 pages. Illustrated by Geoffrey Goss. \$3.50. The author,

nephew of Ernest Thompson Seton, takes the reader on informal rambles outdoors.

The Exploration of Time. By R. N. C. Bowen. New York. 1958. Philosophical Library. 144 pages. \$6.00. The passage of time as revealed by man's knowledge of rocks, fossils and the like.

Exploring the Sun. By Roy A. Gallant. Garden City, N. Y. 1958. Garden City Books. 56 pages. Illustrated in color and black and white by Lee J. Ames. \$2.50. Introduction to the mysteries of the sun. For the reader 8 to 14 years of age.

Hoofs, Claws and Antlers. By Harold McCracken. New York. 1958. Doubleday and Co. 56 pages. Illustrated in color and black and white by Lee J. Ames. \$2.50. This large-size book tells the story of our large mammals.

Exploring the Planets. By Roy A. Gallant. New York. 1958. Doubleday and Co. 123 pages. Illustrated in color and black and white by John Polgreen. \$2.95. Graphic introduction to the planets and what we know about them.

Soondar Mooni. By E. O. Shebbeare. Boston. 1958. Houghton Mifflin Co. 202 pages. Illustrated by the author. \$3.50. Charming story of the life of an Indian elephant that, at the age of two, became a family pet and remained so for thirty years.

Contents noted BY THE EDITOR

FEDERAL BILLBOARD CONTROL STANDARDS

were promulgated by Sinclair Weeks as one of his final acts before retiring as Secretary of Commerce. Great credit is due Mr. Weeks for his steadfast support of the program to protect the environment of the Interstate Highway System from the distracting and marring parasitism of outdoor advertising. The Federal legislation has its severe limitations and these are reflected in the Standards, which cannot go beyond these limitations. As finally promulgated, the Federal prescription is about as good as can be expected, although were it applied by all the States it would not keep the highways free of advertising—merely hold them to somewhat of a minimum. We were happy to note that one new provision was added, namely indicating that a State "may elect to prohibit signs permissible under the standards without forfeiting its right to any benefits provided for in the act." State legislatures will be meeting soon in most States, and now is the moment for concerted drives to enact State control laws. Many States are moving to do so, and success will depend on militant public support.

BLITHELY IGNORING PUBLIC PROTEST against the side effects of the fire ant control program in several southern States, the U. S. Department of Agriculture has gone right ahead spreading granulated dieldrin. From Monroeville, Alabama, comes an alarming report of what happens. Many beneficial insects wiped out; hundreds of chickens killed; more than 50 dogs hauled to the city dump; as many cats suffering the same fate; an undetermined number of turkeys, ducks and squirrels dead; the population of all resident bird species drastically reduced—these are end results. One colored woman is quoted as saying that the insecticide "killed everything on my place except fire ants." While this may not be a scientific conclusion, it is plain from verified facts that this non-selective poison is upsetting the apple-cart so far as both domestic and wild animals are concerned. Public opinion will eventually put a stop to poison programs, or demand that they be based upon certain knowledge and not the desire to spend a lot of money. The big question is: "What will be left by the time public sentiment takes effect?"

THE SOUTH FACE OF EL CAPITAN in Yosemite National Park had never been scaled. This constituted a challenge to a group of young men, three of whom, after some hair-raising experiences, finally reached the top.

The exploit involved driving spikes into the face of this impressive monolith, a palpable defacement of a part of the Park. It involved the time of Park personnel, as has been the case with other similarly ill-advised ventures in other park areas. It cost the young men involved a thousand dollars, which they say they hope to reclaim through sale of their story. It came close to costing one or more lives. But now El Capitan has been conquered. All we can think of to say is—"So what?"

WE ARE MOVED TO REPEAT THAT QUERY

on looking at a picture and reading a story about a salesman in a Buffalo, New York, suburb. He is pictured, with his gun, behind the head of a magnificent white Dall ram. The story reports that, beside killing this fine animal in the mountains between Anchorage and Fairbanks, Alaska, the gunner bagged a 500-pound caribou, a 1600-pound moose, and an 800-pound grizzly bear. The hunter is quoted as saying: "The thrill in killing a grizzly comes when you stand over it and realize that here is the one Alaskan beast which is truly dangerous. A shot which only wounds a grizzly means the brute will try to kill the next human it sees." This makes the grizzly a mighty intelligent animal, and it is intelligent enough to get out of human range if it can, also. By keeping his old automobile three years the hunter was able to afford his Alaskan head-hunting trip, and he is specially happy since the Dall ram is "rare." Somehow we cannot find it possible to congratulate the gentleman on his great achievement.

WHOOPIING CRANES AND TRUMPETER SWANS

are two species of birds that have been much in the news during recent years. The whoopers, now reduced to a small band of free birds, plus six in captivity, have been the object of widespread solicitude. Their flights north to nesting grounds in Canada, and south to wintering grounds in Aransas Wildlife Refuge in Texas, have been followed by many people. Indications are that 1958 was a most successful year for these birds, nine young being now on the refuge, the largest number of youngsters in twenty years. The trumpeters, reduced to a pitiful handful thirty years ago in the United States, now number 735, a new high for birds resident south of the Canadian border. They enjoyed a good year for young, also. These two kinds of birds seem to us to be symbols and to teach us that we must never persecute any species to the precarious point that these two species reached at the hand of man.

R.W.W.



Magpies and plum blossoms are portrayed on this yellow bowl of the Tung Chih period (1862-1874) in the author's collection.

The Hundred Birds

in Chinese art and story.

By MABEL IRENE HUGGINS

On this plate the "hundred birds" do homage to the *feng-huang*, a feathered inhabitant of the myth-world. Plate is of the Tao Kuang period (1821-1850) and is by courtesy of Mrs. F. J. Rost.



TO THE Chinese the word "hundred," *pai*, does not necessarily denote the numeral that comes between 99 and 101. Instead, it may be used to express the idea of "multitude" or even "all." However, we shall not attempt anything so ambitious, but, for the most part, shall keep within the limits of a fraction of the "hundred."

From the earliest times the Chinese have paid attention to birds. Representations of birds are to be found in the pictographs on the oracle bones of the Shang period, on the bronzes of Chou times, and on down through the centuries in art and literature.

A notable example comes from the fourth century, B.C. For nine years Ch'ü Yüan had been exiled from the Court, and had finally become so depressed that he was afraid his soul would leave his body, and he would die. Thereupon he wrote *The Great Summons*, a famous poem that may be found in its complete form in *Translations from the Chinese*, by Arthur Waley. The poet calls upon his soul not to leave him, and among other inducements we find these lines:

"Peacocks shall fill your gardens, you shall rear
The roc and phoenix, and red jungle-fowl,
Whose cry at dawn assembles river storks
To join the play of cranes and ibises;
Where the wild-swan all day
Pursues the glint of idle king-fishers.
O Soul come back to watch the birds in flight."

The satisfaction that came to those who were able "to watch the birds in flight" must have had an influence in the production of the traditional composition "The Hundred Birds Paying Homage to the *Feng-Huang*." In order to understand what this is all about, we must know that the *feng-huang* is a feathered inhabitant of the myth-world, and is above and beyond all terrestrial birds. The *feng-huang* is commonly spoken of as the "phoenix," but we should not allow that term to confuse us, for the "Chinese phoenix" in no way resembles the phoenix of Arabia and Egypt.

The *feng* is the male bird and the *huang* his female mate. They have been variously described—their component parts resembling different birds and animals—the whole giving a total of brilliant plumage finished off with a long, pheasant-like tail. The *feng-huang* is said to be kindly disposed toward all living things, both plant and animal. It is supposed to live on a diet of bamboo seeds. It appears but rarely, and then as an auspicious sign indicating prosperity, or the coming of a good government. And it is believed that the *feng-huang* alights on the *un-fung* tree and no other.

An unidentified artist of the Ch'ien Lung period (A.D. 1736-1795) portrayed "The Hundred Birds Paying Homage to the *Feng-Huang*" on twelve scrolls that now are in the William Rockhill Nelson Gallery of Art in Kansas City, Missouri. Hanging in juxtaposition, they form a painting approximately eleven by twenty-three feet in size. The whole composition is full of life and color. In the middle foreground are fantastically eroded



A skillful piece of craftsmanship is displayed in this mandarin square, which was done entirely in the "forbidden stitch"—tiny French knots. The egret stands on a rock surrounded by waves. This photograph and the one below are by courtesy of The Textile Museum, Washington, D.C.



A mandarin square of the ninth rank shows a paradise flycatcher on a rock amidst waves. The surrounding space is filled with peonies, peaches, bats and clouds. The piece is of the eighteenth century.

rocks, the sort that form an integral and important part of every great Chinese garden. Already one of the *feng-huang* has alighted and is standing on its rocky perch, while the mate is just ready to come to rest. Some of the "hundred birds" have arrived and appear on the abundant garden vegetation, while others are just coming and are still on the wing. All of the birds are represented in pairs, and many of them can be identified. Peacocks, pheasants, flycatchers, Indian cuckoos, red-



The beauty of egrets is shown in this painting by Lu Ch'ao-yang. The photograph of this painting is by courtesy of The Fogg Art Museum of Harvard University.

throats, magpies, and crested hoopoes may be quickly recognized. Kingfishers and swallows dart through the air. And in or near a lotus pond are Manchurian cranes, egrets, mandarin ducks, and ibises. Altogether about 120 individual birds may be counted in the painting. The beauty of the composition is greatly enhanced by the trees and flowers that make a natural framework for the birds. As might be expected, a *wu-t'ung* tree is shown. So is a pine, symbol of old age, and bamboos grow from the rocks. As a suitable and traditional accompaniment for long-tailed birds, a tree-peony occupies a prominent position. A flowering plum is in evidence, as is also a magnolia in full bloom. Roses, hibiscus, and pomegranates add to the bower of flowers, and help in making this a fitting place for the *feng-huang* to receive the homage of the "hundred birds."

The same subject was used on a plate that bears the mark of the Tao Kuang period (1821-1850). Because of the limitations of the size of the plate, it was impossible to depict so many birds, but the *feng-huang* were given the central position and the general effect is quite similar to that produced by the Ch'ien Lung painting.

Of the "hundred birds," nine may be set apart for special consideration. These are the ones that were used on mandarin squares to show the rank of civil officials

during the Ch'ing dynasty (1652-1911)—the crane, the golden pheasant, the peacock, the goose, the silver pheasant, the egret, the mandarin duck, the quail, and the paradise flycatcher. During the Ming dynasty (1391-1644) some differences

may be noted, the oriole being one bird that was used then but discontinued in the later Ch'ing.

The crane holds an important place in the minds of the people. This no doubt came about through the role it played in legends and folklore. It was supposed to be the celestial courser not only of Hsi Wang Mu, the Queen Mother of the Western Paradise, but also of other mythical characters. It has been the custom to burn paper images of the crane at funerals in the hope that the departed spirits will ride to heaven on them. In paintings the Manchurian crane, a handsome white bird with touches of black, is frequently shown. As the crane is symbolic of long life, it is often accompanied by pine trees and the woody *ling chih*, fungus of immortality. Based on the idea (probably erroneous) that the crane is a long-lived bird, there is the popular wish, "May your life be as long as that of the crane." First place was given to the crane, as it indicated the highest rank on mandarin squares of the court robes of civil officials.

China is noted for its variety of beautiful species of pheasants. The golden pheasant was formerly on the mandarin squares of civil officials of the second rank, while the silver pheasant appeared on the court robes of the fifth rank. Another species that should be mentioned

These jade quail of the Ch'ien Lung period (1736-1795) hold stalks of millet in their beaks.

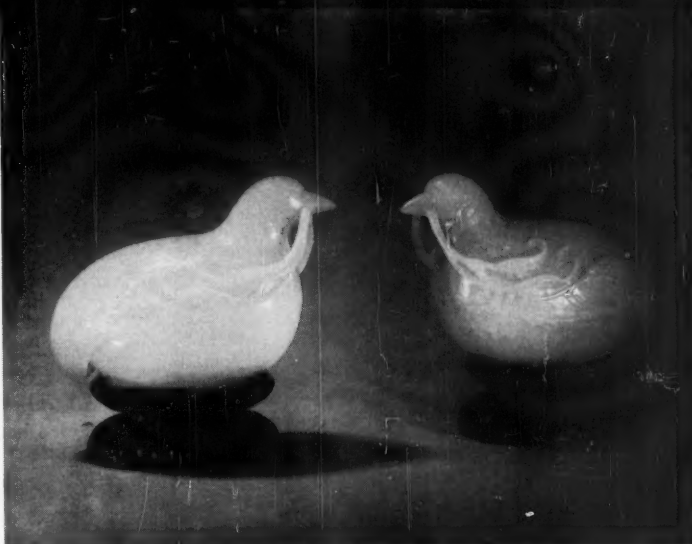
COURTESY MINNEAPOLIS INSTITUTE OF ARTS

is Reeves' pheasant, common in the northern mountains. With a body that measures about fifteen inches, it has barred tail feathers from four feet up to six feet, nine inches in length. These remarkable feathers were used in slow-moving, ceremonial posturing dances to the accompaniment of ancient musical instruments, and made a memorable spectacle.

Because of their beauty, pheasants were great favorites of painters. The story is told that while Huang Ch'uan, who died in the year 981, was an official at Court, he once painted a pheasant on the screen in the emperor's precincts. A hawk was brought in as tribute to the emperor. Spying the pheasant, the hawk made a sudden swoop, but was disappointed in its prey, although it proved to onlookers the skill of the artist.

Reference has already been made to a poem of the fourth century B.C. which mentioned peacocks. Another Chinese poet tells that "peacocks flocked together" in the world-famous garden of Wu-ti, the Warrior Emperor, who reigned from 140 to 87 B.C. It is believed that the peacock was not native to China but was introduced from the Malay Peninsula.

It was only natural that Chinese painters and the decorators of porcelains should appreciate the ornate beauty of the peacock and make it a subject for their work. Porcelains of both the Ming and Ch'ing dynasties portray examples of the peacock accompanied by the showy blossoms of the tree-peony. The Hundred Antiques were frequently used as designs on porcelains. These were objects associated with various aspects of the liberal arts—books, scrolls, incense burners, musical instruments, and similar ornaments—but of special inter-



est to us is a vase holding a branch of coral and two peacock's feathers, an emblem of high rank.

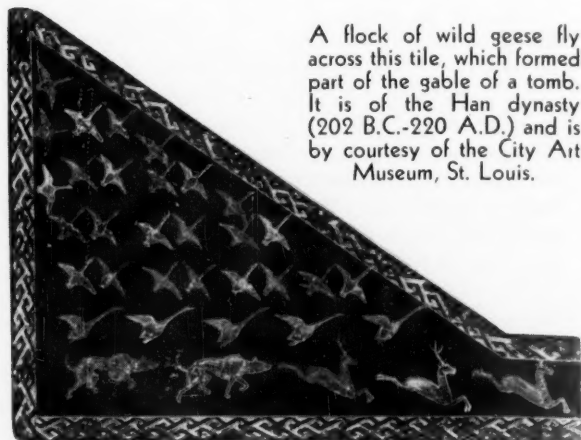
The peacock appeared on the mandarin squares denoting the third rank throughout the Ch'ing dynasty. During this period, also, peacock-feather hat decorations were awarded to officials for meritorious service to the government.

There is an anecdote about the beautiful daughter of a sixth century military commander. She must have been a bit forward for those days, because, having painted a peacock on a screen, she offered to marry the man who could hit the bird twice in succession with an arrow. Li Yüan succeeded, and proved himself as good a shot as she was a painter, for he hit both the bird's eyes. He became the founder of the T'ang dynasty (618-906), and she became the mother of the famous second emperor of that great period.

The fourth rank of civil officials was indicated by a goose on the mandarin squares. But long before this Ch'ing period geese were watched and portrayed in flight. An especially fine example is the architectural fragment illustrated with this article. It is a tomb tile made of baked gray clay, and comes from the Han dynasty (202 B.C.-220 A.D.). From those early days we also have the story of Su Wu, who was held captive by the Hsiung Nu during the second century B.C. He managed to tie a letter to the foot of a wild goose that carried it on its southward flight—eventually resulting in his rescue. Hence, in the Chinese language, a letter may be spoken of as a *yen tsu*, a "wild goose foot."

The beauty of egrets also appealed to Chinese artists, who used them as a popular subject for many pleasing paintings in which lotus blossoms often appeared. Several species of egrets are native to China, and various ones have been shown in paintings—the little egret, the eastern great egret, the great white egret, and probably others. The sixth rank of civil officials was distinguished by an egret on the mandarin squares of that grade.

While the egret is notable for grace and beauty



A flock of wild geese fly across this tile, which formed part of the gable of a tomb. It is of the Han dynasty (202 B.C.-220 A.D.) and is by courtesy of the City Art Museum, St. Louis.



Two cranes in greenish-white jade stand on rocks from which grow bamboo and fungus. Around their heads is a peach branch, a long-life symbol. Piece is of the 18th-19th century. From the T. B. Walker collection of the Walker Art Center, Minneapolis.

of an elegant type, the mandarin duck is outstanding because of its striking appearance during the mating season. The male is a most beautiful duck, with a splendid crest of green, white, and chestnut. The characteristic markings and spectacular manner of displaying his plumage make him worthy of being called the "mandarin" among ducks. The Chinese say that a mated pair becomes inseparable, and in case one dies the other remains single, or even wastes away with grief until it dies. Therefore they are the symbol of married happiness. Mandarin ducks, in pairs, make suitable wedding gifts. The mandarin duck in mating plumage identified the court robes of civil officials of the seventh rank.

A popular bird with the Chinese is the quail, which occurs in great numbers. The Chinese are well-known as keepers of pet birds—the caged captives being valued primarily because of their ability in singing or trick-doing. The quail, however, is kept in captivity for its prowess in fighting, and consequently has become the symbol of courage.

Quail are often seen in paintings, accompanied by millet, or on porcelains. In one collection there is a small vase of the early eighteenth century with a decoration in enamel colors—"a picture suggestive of an autumnal scene. . . trees with autumn-tinted leaves and . . . in the foreground. . . a pair of quails, beautifully painted with a miniature-like finish." On the back of the vase is a couplet saying:

"Years roll by as we sit at the table, painting pictures in colors;

Charmed by all the happy notes of Nature, listening to the calling quails."

The quail was on the mandarin squares of the eighth rank. It must have been chosen because of its courageous qualities rather than its appearance, for it is always said to be a rather ragged-looking bird. In fact, one term

for "ragged clothes" is "quail clothes hundred patches."

On the ninth grade of mandarin squares they used the paradise flycatcher. This is another of the long-tailed birds that artists and craftsmen were fond of portraying in paintings and on embroideries. This flycatcher has a crested head of iridescent blue-black, a back of striking cinnamon-red, with breast and under parts of gray and white. Its central pair of tail feathers are from ten to fourteen inches in length. It makes a beautiful sight when flying through leafy branches as it catches insects while on the wing.

Some of the other "hundred birds" that deserve mention are the magpie, the swallow, and the kingfisher.

The Chinese magpie is not considered a raucous character but a symbol of happiness and good fortune. It acquired this rating through its part in one of the early legends of the Manchu people. The North China azure-winged magpie is quite different in appearance from its black-and-white relative. At all seasons it is a beautiful bird with velvet black head, a body of ashy gray, and wings and tail of a rich azure-blue.

Swallows are another symbol of good luck, and any family is happy if a pair decides to nest under their eaves. Poets frequently mention swallows, and in paintings willows and swallows go together.

The Indian kingfisher is common throughout Asia, and breeds from India to the Pacific and north to Manchuria, and the beautiful turquoise-blue back feathers have for many years been a source of commercial gain, as they have been used, inlaid in silver, for hair ornaments and other jewelry. In that capacity, however, they cannot compare in beauty with the glint of color they exhibit in Nature as the birds flash away and skim over the surface of the water.

Birds have contributed much to the enrichment of the language. Thus, "Everything is suited to its own purpose" seems prosaic when compared to the Chinese—"A crane's leg may be long, but you cannot make it shorter without misery to the crane." And how better can you say that a woman is a widow than by saying she is "a solitary wild goose"? The mythical *feng-huang* provides several delightful expressions. A filial son on whom his parents rely is none less than "the egg of a phoenix." A preeminent person is "a phoenix among birds." "The soaring phoenix and the prancing dragon" is used in praise of someone who is becoming famous as a writer. The climax, however, is reached in the subtle way in which a person is told to mind his own business—"A phoenix does not leave its perch on the imperial gate."

Perhaps we can make no better wish for China than that the *feng-huang* will again alight on the *wu-t'ung* tree—and soon.





The Presidential Range of New Hampshire's White Mountains forms a backdrop for the green meadows and woods of the Jefferson Valley. The ravines on the flanks of Mount Washington (center) and the higher peaks of the range were still filled with snow when this picture was taken during the second week of June, 1958.

*A story of early
weather study at an*

Outpost of the Arctic

By PAUL MASON TILDEN

IN THE fall of the year 1870, Joshua Henry Huntington, right hand man to the geologist of the State of New Hampshire, left the tiny village of Ammonoosuc and set out for the summit of Mount Washington, highest peak of the White Mountains. Huntington was the advance guard for the first party—and indeed the first human beings—to spend a winter on that barren and often ferocious summit, and the mission was simply stated. It was “to contribute something to the solution of the great question whether science can forecast the weather for hours and days beforehand.”

Charles H. Hitchcock, State geologist, and his able assistant, J. H. Huntington, were the guiding spirits behind an enterprise that excited world-wide interest among scientists and laymen alike during the winter of 1870 and 1871. The science of weather prediction was then in its very infancy. Indeed, the first government weather forecasts of the period were officially referred to as “probabilities,” and the Army’s Chief Signal Officer, identified in the public mind as author of the weather announcements, soon acquired the unofficial title of “Old Probabilities”—a nickname that inevitably contracted to “Old Prob.”

“As the farmer studies the cloud-caps upon mountains to forecast the weather, so telegraphic reports of the conditions of the atmosphere upon the highest summit

in eastern America would enable ship owners to judge the approach of storms. . .” For such a challenge, Professor Hitchcock was will to risk money from his own pocket; and at one time it appeared likely that the public would cheerfully allow him to do so. The good professor rather acidly remarked, during the summer prior to the venture, that his general appeal for funds in behalf of the proposed expedition had “failed to excite any particular interest.”

Such an uncharitable attitude seemed to indicate that the public had not taken too seriously an earlier rumor that the famed Smithsonian Institution in Washington had made an offer of a thousand dollars—a handsome sum, then—to the first person who would spend a winter on the summit of Mount Washington to make meteorological observations. Abroad, too, was report that a Boston publishing firm had offered five thousand dollars to the person who would spend a winter there and produce an account of observations that the firm could print and sell. There was also rumor of a vague “somebody” who was offering a large but unstated sum for similar purposes.

There were many disheartening delays, and it several times appeared that the proposed work would have to be deferred, but one by one the difficulties were smoothed away. A lengthy correspondence with the Mount Wash-

ington Railway Company brought permission for use of the company's summer depot on the mountain top, and a generous offer to transport supplies to the summit without charge over the newly built cog railway.

The United States Army Signal Corps, ancestor of our present-day Weather Bureau, suddenly became interested in the project—not to the extent of furnishing money, but with the offer of a trained observer and enough specially insulated telegraph wire to extend from the summit of the mountain to the railroad station at its base. Finally, the Signal Corps offered to furnish the meteorological instruments required during the investigation. The return on this investment was to be one daily telegraphic report that the Service could distribute to the nation's leading newspapers.

When Joshua Huntington reached the "highest summit in eastern America"—actually Mt. Washington is the highest peak in *northeastern* America—to act as chief of the observatory, he established himself in a heavily insulated eleven-by-twenty-foot room previously prepared by members of the expedition in the southwest corner of the railway depot. A glance at the depot building showed that the railway company carpenters had not misjudged their mountain. The twenty-two by sixty-foot wooden structure boasted a frame work heavily reinforced with wooden braces and iron rods and bolts, and sat on sills that jutted eight feet beyond the massive walls. Over the roof of the depot were passed three heavy iron chains deeply rooted in living rock on either side of the building. The door of the party's little room opened into a tiny ante-chamber that afforded access to the out-of-doors through a small door.

On November 12, 1870, Joshua Huntington began the work of the expedition, keeping the daily records in anticipation of the arrival of the rest of the party some three weeks later; but disaster even then hovered over the beginning of the work. On November thirtieth, A. F. Clough and H. R. Kimball, the two photographers for the expedition, made a start for the summit with two New Hampshiremen, Charles Cheney of Orford and C. F. Bracy of Warren. The men had been delayed in arriving at the base of the mountain, and it was past the middle of the afternoon when the decision to commence the climb was made—a near-fatal error.

The party of four had reached a point some half-mile below timberline when a storm was discovered approaching from the direction of the Green Mountains to the west—a circumstance, said Kimball, that "was fearfully impressive, and prompted us to our best endeavours." Their best endeavors, however, fell short of the mark. Near the foot of Jacob's Ladder, about at timberline, the storm struck, "with dense clouds of frozen vapour, driven so furiously into our faces by the raging winds as to threaten suffocation."

The men were battered about and repeatedly thrown to the ground. After a time, Kimball became so exhausted by the struggle that he requested Clough and Cheney, both powerfully-built men, to leave him and save themselves. Both men refused, and forced Kimball to continue on. Meanwhile, Bracy had somehow become separated from the party.

With a seventy-mile-an-hour wind and the temperature at seven above zero, Kimball, now only partly conscious and wholly indifferent to his fate, was urged

One of the mountain phenomena studied by the expedition of 1870-71 was the formation of frost-work or rime, which, under certain conditions of temperature and humidity, may produce fantastic growths like those below. The feathery masses grow into the wind. At the right of the rime-covered angle irons is a fuel trailer of an Air Force unit engaged in icing research on the summit of Mount Washington. Photograph was taken in March, 1956.

PHOTOGRAPH COURTESY OF AIR RESEARCH & DEVELOPMENT COMMAND



forward a few feet at a time. When the struggling men finally reached the summit, it took them half an hour to accomplish the final five hundred feet to the observatory, while Bracy, half dead with fatigue and cold, had arrived at the summit by another route. It had been a narrow escape!

At intervals, the other four men arrived safely at the mountain's summit; so that, by the fourth of December, the roster of the expedition consisted of J. H. Huntington, in charge; S. A. Nelson, of Georgetown, Massachusetts, a man greatly interested in the science of meteorology, who had volunteered to join the expedition; A. F. Clough, artist and photographer for the party; H. A. Kimball, photographer; and Sergeant Theodore Smith, observer and telegrapher for the Army Signal Service. Professor Hitchcock, father of the expedition, had an office in Hanover connected by telegraph with the observatory at the summit, and during favorable breaks in the weather made a number of visits to the little group on the mountain-top.

* * * * *

Mount Washington, the 6300-foot chief of the White Mountain range, sits astride a turbulent line that marks an upper-air battleground between the bitter winds of the Arctic and the warmer, moister air masses of the temperate zone. During the long winter, the clashes between these two opposing forces spawn hurricanes and blizzards of a violence not surpassed by those of either Arctic or Antarctic, and the fury, turbulence, and frigidity of the winter winds that lash Washington's frost-shattered summit command the respect of the hardiest mountaineer.

From the Canadian life zone of the lower mountainside, and its forests of beech, birch and spruce, the adventurer moves up to timberline and the alpine zone, where the spruce, now alone, becomes more and more dwarfed, and spreads its long branches horizontally from stubby trunks whose heights may be measured in inches. Above the stunted spruce, the gray rock fragments give shelter and a measure of warmth to the Lapland rhododendron, the dwarf birch, the alpine willow and the Labrador tea, while higher yet are the plants of still another world—the Greenland sandwort, the arctic rushes, the diaspensia and the calliope, the sedges and the lichens.

During July, flowers of the sandwort are host to somber brown *Oeneis*, butterfly of the Arctic, while the rust-colored White Mountain fritillary, relic of the ice age, flits through alpine meadows. On the summit of this mountain, the yearly average temperature is seven degrees below freezing; summer means July and a part of August; and here, in April of the year 1934, the most violent wind ever recorded by an instrument blew at the rate of 231 miles per hour.

* * * * *

"We have had probably as severe a tornado as will



This is the barren summit of Mount Washington as seen from the southeast, pictured in an old photograph. The dark patches in foreground and at right are prostrate spruces whose branches are entwined among the rocks.



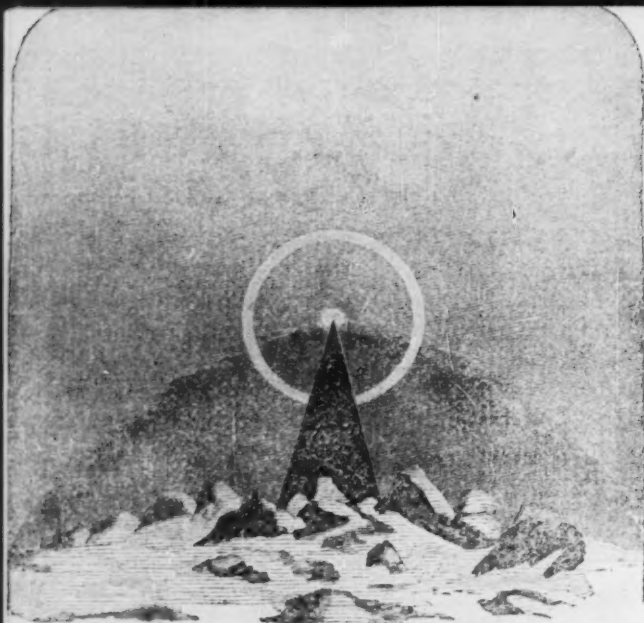
ILLUSTRATIONS FROM HITCHCOCK'S
"FINAL REPORT"

At the left is a wood block engraving of the type of hand-held anemometer used by the Hitchcock-Huntington expedition.

visit us during the winter," wrote Kimball in his personal diary for December fifteenth. The velocity of the wind was recorded at 7 p.m., and it was 92 miles per hour. After that, it was not safe to venture out with the anemometer. The wind continued to increase until, towards morning, it blew "a terrific hurricane."

"The wind roared terribly," said the diary, "...and the wild rage was so deafening that we were obliged to shout to our utmost in order to be heard." Throughout this night, the men were prepared for the worst, expecting the building to give way at any time. Axes and saws were kept at hand in the event of disaster, and hardtack stowed away in coat pockets. By morning, the wind velocity had abated to 84 miles per hour, and the thermometer stood at -15° . "We were duly thankful for this slight change," wrote Kimball.

On December 21, S. A. Nelson noted in his journal that there were no signs of animal life outside, but that



Among the atmospheric phenomena seen by members of the expedition was the rare "specter of the Brocken," reproduced here from a contemporary wood engraving. The dark cone is the shadow of the observer with a "glory" about the head. Above the foreground is the shadow of the mountain, while the large circle is the colored prism, or corona, resting on clouds.

there were plenty of mice inside, "and it is thought that a sable has taken up winter quarters under the building." On January 22, there was a steady wind of 80 miles per hour, with an extremely low temperature—thirty-four below zero was recorded between the inner and outer doors of the ante-chamber. Nelson tied a rope around Huntington's middle and stood inside the little chamber, acting as an anchor while Huntington was blown about at the opposite end in his attempt to secure a reading with the portable anemometer. The wind roared all night; but it abated on the twenty-third, while the outside temperature dropped to -43° .

February 4, at 9 p.m. "The wind, rising toward morning, has held its own all day, at no time being below seventy-five. . . This has been so cold a day that we found Dr. Kane's voyage most suitable reading. At 7 a.m., -33° , and it has gradually worked down to -40° . We have the stoves at red heat. Ten feet from the stove, at the floor today, the temperature was only 12° . . . I froze my fingers while sawing off a piece of pork for our 'Sunday baked beans'; was out only five minutes. It was like cutting into a block of gypsum. . ."

At midnight of the fourth, the wind blew prodigiously, and again the men feared for the building. The sturdy walls bent inward with each blast, and rebounded noisily with each sudden lessening of pressure.

"Everything movable is on the move," said Nelson. "Books drop from the shelves. . . When we hear an unusually loud report in the outer room, one goes to inspect. Nothing has given away yet." The thermometer registers -59° . It was impossible to leave the observatory for a reading, but the wind velocity was estimated at 110 miles per hour, and the building "had the motion of a ship scudding before a gale."

On February 10, there was a furious bombardment of the observatory by fragments of ice and frost-work, blown from the summit and hurled like projectiles by a 90-mile-an-hour wind. A number of windows were

smashed, and boards were nailed over the empty casings without delay, as the temperature was hovering at twenty below zero. "The supply of ammunition was exhausted by 10 o'clock," wrote Nelson, "and then, though the wind was terrific, we did not mind the gale."

Hardship was inevitable, of course, under such extreme conditions, but was cheerfully accepted by the hardy group. Meals, as well as weather, were inclined toward the rough-and-ready side. There were numerous frosted fingers, ears, and toes, especially during times when the telegraph wire had to be repaired. Sergeant Smith, the Signal Corps observer, became ill towards the end of the winter, but manfully carried on with his duties. Nelson remarked that the observatory was "a rough place to be sick in," and slyly added that observer Smith was, at least, "safe from the doctors!"

There was much to compensate the party for the rigors of life atop the bleak summit, and the weather was not entirely bad. On occasional fine days, the men climbed among the crags, exploring and giving name to some of the rugged features of the mountain. One of the great gulfs of the northeast mountainside they named after their observatory chief, and the great ravine is known even today as Huntington's.

"There were days," wrote Nelson, "when the shifting views of each hour furnished new wonders and new beauties, in the play of sunlight and changing cloud-forms, every hour a picture in itself, and perfect in details."

Then, too, there were the scientific studies and reports, the reasons-for-being of the expedition. There was the study of frost-work—rime formation, in modern parlance—the charting of temperature and moisture conditions, the daily notations of wind velocity and cloud formation, and, of course, the daily telegraphic report to the Signal Corps. Various atmospheric phenomena were seen, including the rare "specter of the Brocken," in which the observer's figure appears as a grotesquely giant shadow on the nearby clouds, capped with a shining halo and surrounded by circles of color.

The men had not been on the summit long before they realized that their elevated position exposed them not only to punishment from a hostile environment, but to a considerable amount of none-too-subtle humor in the public press.

"A party of fossilized scientific maniacs are wintering out on the top of Mount Washington, N.H.," began one such dispatch. ". . . We palpitate as we record the first sensation which they have condescended to let loose on the world. It is that they have discovered a new and hitherto unknown species of—snow-flake!"

"A noble and fearless band of (Continued on page 53)

Cuba's Royal Palm Climbers

By W. H. HODGE

Photographs by the Author

The handsome royal palm is the national tree of Cuba, and in that country is protected by law against indiscriminate cutting. Mature royal palms may each produce a dollar's worth of oil-bearing fruits annually, and represent a considerable natural resource to the people of Cuba.

IN CUBA, an island famed for its palms, no species is more familiar, widely distributed, or more beautiful than the native royal palm, or *palma real*, the *Roystonea regia* of botany. In addition to gracing the lush, green Cuban landscape, this tall, handsome palm also serves the country folk as the source of a number of useful products.

Among the best known of these are the smallish fruits that the Cubans call *palmito*. These fruits are borne in tremendous clusters attached at the summit of the smooth trunks at the point where they are joined by the green bases of the giant, feather-like leaves. *Palmito*, with its high oil content, is the principal food used for feeding and fattening Cuban hogs, as well as other stock. Thus it is a sort of tropical *mast*. The Cuban farmer speaks familiarly of "one hog" or "two hog" palms, depending on the quantity of fruit a tree produces. Indeed, each mature royal palm is said to yield annually a dollar's worth of *palmito* alone, which means that Cuba's palm population represents a considerable natural resource, and in Cuba there is a national law that forbids (without special permit) the felling of royal palms for boards, cabbage-bud, or any other purpose that would kill the noble trees.

for January, 1959



To reach the fruit clusters, the *trepador* uses two strong loops of rope, each fitted with a kind of stirrup. He climbs the palm by shifting his weight alternately from one loop to the other.

As with most fruits, that of the royal palm falls when it is "dead ripe." For this reason it is generally gathered before fully mature so that the fruit may be more easily carried, while still attached to its stalk, from the fields, hills, or roadsides where the palms grow to the backyard where it finds its use as stock feed.

To harvest ripening *palmito* from the lofty tops of palms that may reach upward nearly a hundred feet might seem like a hopeless task. It is not only a matter of climbing a smooth, arrow-straight trunk, free of any branches, but also involved is the safe harvesting of fruit clusters that may weigh fifty to sixty pounds apiece. If such clusters were dropped to the ground, most of the berry-like fruits would fall off and thus would be scattered, damaged, or lost.



Actually, among Cuban country folk, there has developed a special trade or craft, that of the so-called *trepadores*, or "royal palm climbers," whose sole job in life is to climb and harvest *palmiche*. Trained from youth, these working acrobats have developed a special technique for climbing the smooth palm boles to obtain the ripening clusters of fruit. Since *palmiche* clusters ripen continually throughout the year, the *trepadores* can count on a year-around demand for their services, and they are looked upon with respect by their Cuban neighbors.

After the picker harvests the fruit cluster, it is dropped upon a rope that permits it to slide undamaged down to an assistant on the ground. A *palmiche* cluster from a mature royal palm may weigh as much as 50 or 60 pounds.

To the Cuban *trepador*, a royal palm is as easy to ascend as is a pole to a trained telephone linesman, but his equipment is far simpler. The palm he must ascend has a surface almost as smooth as a floor. No heavy boots fitted with climbing irons for the *trepador*! He goes to work bearing only two strong but simple loops of rope, each fitted with a kind of stirrup, well padded for comfort. Once the two ropes are looped around the trunk in a sort of running hitch, he steps into the stirrups, pushing one leg through to the knee while leaving the ball of the other foot resting in normal position on the other stirrup. Simple shifting of his weight in "seesaw" fashion permits him to lift each loop alternately up the smooth trunk.

Within a few minutes the climber reaches the summit of the trunk where the clusters of *palmiche* grow. From his belt he now unties a long coil of rope, one end of which is firmly fastened around the trunk. The other end is pulled tight by an assistant below, or fastened to some convenient nearby tree so that the taut rope angling downwards may serve as a convenient support down which *palmiche* clusters can slide. With his sharp machete, our *trepador* now harvests the fruit clusters, dropping them on the rope so that, straddling it in fire-pole fashion, the clusters slide down, to be caught below by the waiting assistant.



PRELUDE

*Now does the bony tree
Stand black against the sky;
No leaf-lights flutter high,
No bird flutes melody,
No nest holds mystery.*

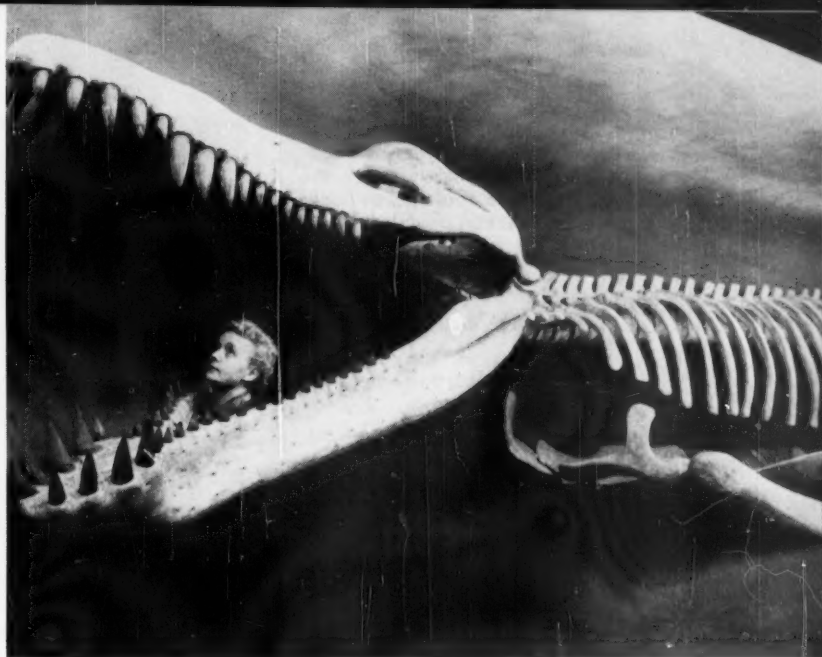
*The clouds are dark and low
Against the curtained gray;
The wind sews up the day
In stitches to and fro;
The ground is cold and slow.*

*Life quiets down to creep
Deep into earth or hole,
To meet the niggardly dole
With summer's boarded heap,
Or comfort's cloak of sleep*

*Over each shivering thing—
The grass, the bud, the heart
Nature with patient art
Holds her protective wing,
And shields the folded Spring.*

Jacob C. Solovay

Miss Nelda Wright, research assistant and editor of publications at the Museum of Comparative Zoology at Harvard University, casts a "prey's-eye" look from the massive jaws of *Kronosaurus queenslandicus*, largest carnivorous animal ever to inhabit the sea. The largest of the 80 teeth surrounding Miss Wright measure eight inches in length.



A Sea Giant Goes to Harvard

By ALDEN S. WOOD

Photographs by
William H. Tobey, Harvard University

THE MUSEUM of Comparative Zoology at Cambridge's storied Harvard University has accepted a new tenant and has given him a private room, at that. This museum is a high-rent district, indeed; you do not just pay and move in. There is a waiting list, as this new roomer will quickly agree. It took him 100 million years to make the grade.

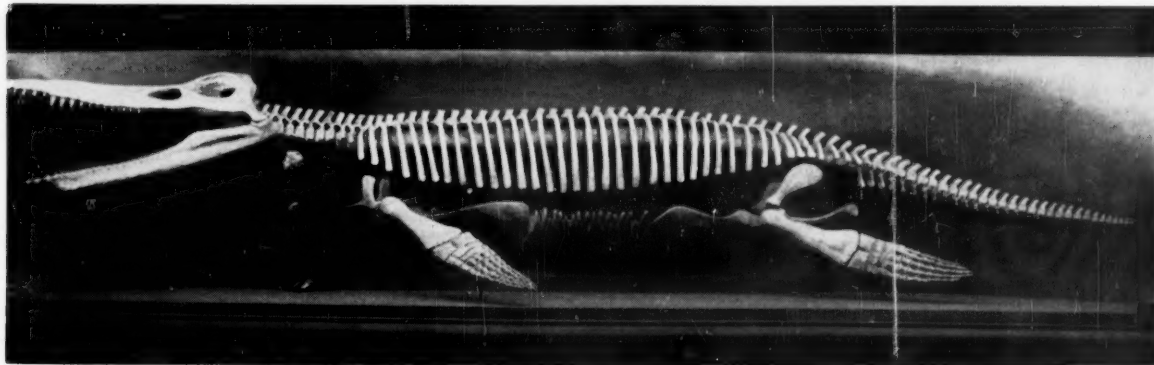
I am referring to a giant fossil skeleton, possibly destined to become one of the most famous in the world. It is that of a *Kronosaurus queenslandicus*, next to the whale the largest marine animal ever to live. It is the only such skeleton that is known to be in existence today.

Poised in an attitude of motion against a sea-blue backdrop, *Kronosaurus* is an awe-inspiring sight, no matter how you view him. His over-all length is forty-two feet. Eighty spike-like teeth, which brand him a carnivore, jut from the gaping jaws. The largest of these measure eight inches.

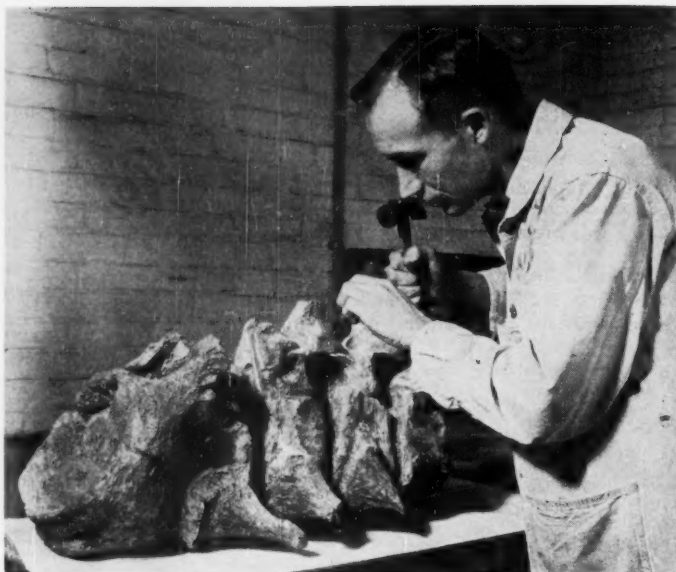
Kronosaurus' biography begins in the Lower Cretaceous period of earth's geological history, about 100 million years ago. He lived in a vast sea, today's southwest Pacific. When he died, his body sank by chance to that part of the bottom that would one day be Australia.

As he lay there he became covered ever so slowly with

Some idea of the immense size of *Kronosaurus* may be obtained by comparing the great skeleton with the woman standing beneath its jaw. The skull is nine feet long; the neck, ten feet; the body, twenty-three feet; and the tail measures another ten feet. *Kronosaurus* roamed the seas of Lower Cretaceous time, some hundred million years ago.



Removing the skeleton from the enclosing rock was a painstaking and delicate job. Here Arnold Lewis, preparator at the museum of comparative zoology, patiently chips away at a section of vertebrae.



down-drifting sediments, and eventually was completely entombed in limestone. More millions of years passed and some great change brought Australia up from the sea into the sunshine.

Instantly, the forces of erosion attacked the new land. Wind and water chafed endlessly at the soft limestone and, finally, bits of *Kronosaurus*' fossilized skeleton began to peep whitely through.

One day in 1931, a young Harvard research associate named William E. Schell, on expedition at Army Downs, North Queensland, happened across this find of a lifetime.

Judiciously-placed dynamite charges were used to blast the remains of *Kronosaurus* from his rocky bed. The blocks, ranging in weight from one ounce to 300 pounds and totaling more than four and a half tons, were crated and shipped to the University the following year.

The painstaking operation of removing the soft but resilient skeleton from the rock was performed with hammer and chisel and pneumatic hammer by Arnold Lewis, preparator at the museum. The work was largely financed by Godfrey L. Cabot, a Harvard alumnus interested in biology.

Once freed, the bones were immersed in acetic acid to remove small rock fragments and clean the surfaces. Gaps left in the fossil skeleton were filled in with plaster of Paris, glue, and asbestos fiber.

Kronosaurus, classed as a member of the long-extinct plesiosaurs, or marine reptiles of the Cretaceous sea, differs strikingly from his brethren in one respect. Most plesiosaurs had long, flexible necks surmounted by small heads—they hunted by sweeping their heads from side to side as they paddled along with their oar-shaped

limbs. *Kronosaurus*, however, has a relatively short ten-foot neck and a massive, triangular-shaped skull nine feet in length. It is likely that few, if any, creatures in the sea could meet him in combat and survive.

The remains of other species of plesiosaurs have been discovered in England, Germany, and, in the United States, in New Jersey, Kansas, and Wyoming. Often, in the position of the stomach, small stones were found. It is speculated that these stones, called "gastroliths," may have been swallowed to aid in the digestion of prey that had been gulped down whole.

Accommodations befitting the size and importance of *Kronosaurus queenslandicus* were specially provided by the museum's director, Dr. Alfred S. Romer, who supervised the reconstruction. Two heavy supporting posts, which would have obstructed the visitor's view, have been replaced by an I-beam.

This, then, is the story of how *Kronosaurus* happened to go to Harvard. Will it be worth it? We will probably have to wait another hundred million years to find the answer to this question!



WILD STALLION

*From the train car window I saw him stand,
The golden stallion, high on the mesa rim,
And grazing far below, the little band
Of mares and colts; sun fingers burnished him
Until he seemed no longer flesh and bone
But wrought in precious metal, creature of grace,
Unfettered as the wind, standing alone,
The last proud King of a vanishing, kingly race.
Let him drink a while at the silver stream,
Let him stand on the plateau under the mesa stars,
Let him run the miles and dream his wild, sweet dream
Against the sure encroachment of fence and bars.*

Alma Robison Higbee

The Termite's Place in Nature

By MAX CARASSO

WE ARE not far away from the time of year when you should not be surprised to see an astonished housewife, frightened by the sudden emergence of a cloud of winged creatures from an apparently solid wall or floor, rush from a house in informal attire. Recently, a murder trial was actually halted in Louisville, Kentucky when such a cloud of insects evacuated judge, jury and contending attorneys in a few minutes. These were swarming termites.

Of course, no termite can go through an unbroken surface. But the termite accomplishes its Houdini tricks by carefully concealing, until the very moment of use, all possible exits from the colony. These exits are of different types, varying according to the immediate area. An innocent-looking crack between two cinder blocks in the cellar wall, or between two boards in the parlor floor, may conceal a termite tube the other end of which connects with a termite colony several feet under ground. In its simplest form, this tube is a flattened, brown mud channel, about a quarter of an inch on the outside. On the inside it is just about wide enough to allow two columns of termites to pass each other in opposite directions. The tube maintains the humidity and darkness that are essential to all termites, except the kings and queens at mating time. Quite often, tubes on the surface of a solid concrete or brick wall serve as covered bridges through which termites can reach the wood from the ground, or the reverse. In such cases, the tubes are readily visible for only a few feet, a fraction of their total lengths.

Another type of exit is one that has no opening to the outside until the actual moment of use. These are parts of floors or walls where termites have eaten almost to the very surface, but where they have left a thin cover of

wood, and sometimes only the film of varnish. It is only the work of moments for the worker termites to open innumerable exits to the "outside," which, of course, often means inside the house. Although often called "Public Enemy Number One" because of its destructiveness to wood, the termite is incapable of direct harm to people, or to any other form of animal or insect life. Even living and growing wood is usually immune to such depredations. Actually, the termites' work in disposing of dead wood is one of the most essential functions in Nature.

Before the termites swarm, the whole colony has been occupied with elaborate preparations. For the best part of the year, the colony's energy has been devoted to maturing the new kings and queens. Child labor—the labor of the immature, wingless forms—supplemented by that of oldsters who have remained in an immature state, is the rule. These immature forms, called nymphs, outnumber the reproductive termites by thousands. They are "childish" in their lack of sexual development, and in their concentration on household tasks.

Although termites instinctively cooperate for each other's benefit, they lack what we would call "social graces"; table manners, for example. A termite on his way to work, suddenly becoming hungry, will stop another just returning from feeding, and will accept his regurgitated food. Two termites groom each other in turn by licking their bodies. If, in the course of this, one should accidentally bite the other, he will chew and swallow the morsel of flesh, the other unprotesting.

Ill or crippled termites, dragging their broken bodies around the colony, are doomed. Since they can do no useful work, they



HUGH SPENCER

A worker termite, thirteen times natural size.



The termite, often referred to as "Public Enemy Number One" among insects, may invade the timbers of buildings in search of its basic food, cellulose. The illustration shows the skeletonization of a timber by termite galleries.

serve only as mobile, living cafeterias. They are not eaten all at once, but a bite at a time. On occasion, these insects eat some of the eggs and tender infants entrusted to their care.

Although cellulose, the staple food of termites, is an excellent source of energy, it is lacking in one of the four elements essential to life processes. The missing element is nitrogen, without which protein cannot be formed. Without protein, no living bodies, animal or vegetable,



can be formed. Therefore, in addition to their diet of cellulose, termites must also have a source of protein. Some of this the termites obtain from funguses that are found in wood. But this is insufficient to supply the needs of rapidly growing colonies of termites. So by eating each other's feces and their own dead friends, and, in extreme cases, their eggs and infants, they conserve their available supply of protein to supplement that which termites can derive from their own limited food sources.

The same drive for survival accounts for the predominance of child labor in the termite colony. Only very young termites that have not yet taken on permanent forms, and older workers, who retain their immature form throughout life, are able to carry their full quota of protozoa. Such microscopic one-celled animals are the only means through which a termite can digest his meal of wood. A healthy worker termite will carry, in his abdomen, his own weight of such protozoa. Soldier termites, whose huge heads guard the entrances to the colony, carry no protozoa, since their large jaws, useful for repelling invaders, are toothless and therefore of no use in chewing wood. Consequently, a full-grown soldier termite must be fed regurgitated food by young and worker termites who have predigested it. The kings and queens must be fed in the same way, because

The floor timber shown above has been completely destroyed by a termite colony. Damage like this in public buildings has sometimes lead to catastrophe.

PHOTOGRAPHS BY JOHN SUMSKI

These termite tubes in the beam of a dark basement have been built downward to reach the moisture of the ground.

carrying a load of protozoa would interfere with their ability to fly. Swarming queens carry only enough protozoa to infect their first young, since these could not otherwise survive.

Swarming termites wait to fulfill their destiny until the outside moisture and temperature are just right. By a wise provision of Nature, these kings and queens, although physically mature, will not become sexually mature until after swarming. This serves Nature's purpose in two ways. First, it orients the instinct of these reproductives to the outside world, where they can establish new colonies for the continuance of the termite species. Second, it reinforces this purpose by providing that each termite colony will tolerate only one sexually mature winged king and queen. If, after reaching maturity, king or queen tried to return to the colony, they would be immediately destroyed by the very workers who fed them and nursed them before.

In the frenzied activity that accompanies the approach of the critical moment, the wingless workers and nymphs, whose usual concern is with keeping the colony securely closed, now busily chew their way



through the last splinter of wood, or burrow through the last thin layer of earth. While the winged kings and queens impatiently crowd the exits and push their way through as fast as they can, the workers and nymphs, in their excitement, ignore their intense instinctive aversion to light, and expose themselves carelessly at the openings.

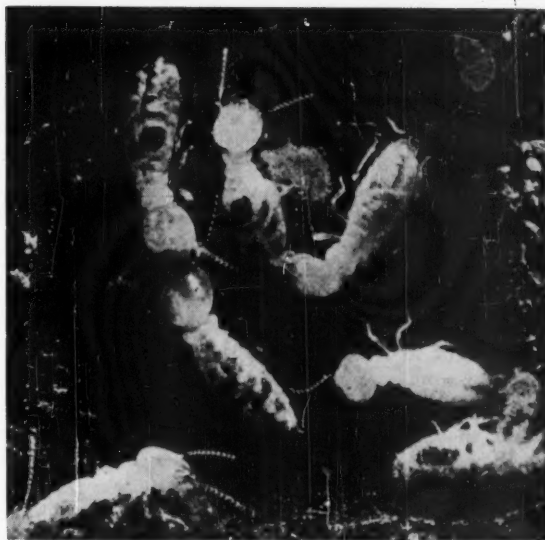
Some biologists have maintained that this annual swarming from the colony corresponds to the process of birth in a larger animal, with individual termites bearing the same general relation to the colony that cells have to a larger body. In any case, it is the moment of fruition to which the colony has bent its labors for the past year. Also, since it usually takes place soon after the sunlight has warmed the spring air, it is usually the moment when the panic-stricken housewife may flee the premises in nothing but her dressing gown or other light attire.

Once out in the open, the insects that are to mate take to the air along with thousands of their fellows. Within a few minutes they drop to the ground and remove their wings. It is only then, and not one second before, that the kings and queens become interested in each other. If the curious motions of the female, during the process of dropping her wings, are intended as devices to attract the male, they are, up to this time, certainly unconscious. But the female's posture on alighting, with the tip of her abdomen uplifted and the subsequent actions of the male, indicate that the female is now emitting an attracting odor from her lower extremities.

Now the wingless reproductives run rapidly in all directions. When two meet, they stand with their heads close together, moving their antennae over each other's heads. If the king proves acceptable, the queen turns quickly and speeds away, apparently fully confident of being overtaken. From this time on the mating pair are seldom separated, and can be frightened away from each other only with great difficulty. The relationship remains platonic, however, for the several days during which they work alone to prepare the under-ground home that may some day become a vast colony. Only after they have completed these preparations does copulation take place. This union endures for life, even though, in the tropics, the female may grow to the monstrous size of three to five inches, while her mate remains his original size of three-quarters of an inch, or even shrinks slightly with age. Our native termites are, of course, much smaller, the male averaging one-quarter of an inch long and the female rarely exceeding three-quarters of an inch.

This huge termite castle in Panama, constructed of pulp and clay, measured more than eleven feet in height and was more than thirty-one feet in circumference at its base. Such colonies are sometimes invaded by specialized forms of spiders, centipedes, beetle larvae, and other predators.

PHOTOGRAPH BY FRANCES MAY



The illustration, from Michener's "American Social Insects," shows a pair of termites exchanging food orally, while beside them one termite obtains excretions from another.

Fortunately, from the viewpoint of the human homeowner, few termite matings are completed. The swarming reproductives encounter a fantastic variety of dangers. Thousands will perish because the soil is too dry, or drown because a shower has occurred during the nuptial flight or soon after. The survivors of these impersonal hazards must, depending on their habitat, also face hungry birds, reptiles, lizards, chameleons, toads, predaceous wasps and flies, crickets, black bears, moles, skunks, armadillos, apes, rats or other forms of life. Three thousand termites have been found in the stomach of a single toad.

For those termites who survive there are other dangers. In Chile, a colony of termites may find that, in the very galleries they have built, a worm-like, primitive animal, the ferocious *Peripatus*, now lives, roaming through the corridors and eating those unfortunate enough to cross its path. Elsewhere, termite colonies are invaded by specialized forms of spiders and centipedes, beetle and fly larvae, and many other predators. Most fearsome of these is the anteater, who considers termites as great a delicacy as ants. Breaking into the nest with its sharp claws, it inserts its long, sticky tongue, picking up large numbers of the inhabitants.

In the tropics the termites are esteemed as part of the human diet. But among all their enemies, it is to the ant that termites owe the subterranean darkness of their lives. For the termites' other enemies may vary in kind, in numbers, and in voracity from place to place. But ants are nearly everywhere, and all the larger species, at least, display the same appetite for termites. From these ubiquitous foes, truly, termites have no place to hide, except in their self-constructed

retreats under the earth, in their mounds, or in the interior of wood. Even in the bowels of the earth, any accidental break in a termite gallery will entice numbers of ants to carry away some of the inhabitants. Great armies of ants often invade and wipe out complete termite colonies.

Any exposure of a termite gallery, such as may be caused by prying into a wooden post with an ice-pick, may set off a raid. Several termites will fall to the ground, where they may soon attract the attention of a large black carpenter ant. The ant picks up the termite and goes off to its nest. On the way it may meet another ant and stop while the newcomer examines its burden with its antennae. This second ant then makes its way to the source of supply. Soon several ants find their way to the post, each picking up and carrying away a single termite, and each looking for all the world like the theatre-front posters of King Kong holding the white-skinned heroine aloft in his arms.

Of course, the perils of termite life are not likely to earn the insect forgiveness for its destructiveness. Its undoubted depredations, and the millions of dollars of damages it inflicts on home owners, inhibit sympathy.

However, life on this earth is largely dependent on certain well-known cyclical movements of the elements necessary to sustain it. The carbon dioxide exhaled by humans and animals is absorbed by green plants. These absorb the carbon and release the oxygen, which animal life reconverts into carbon dioxide. Nitrogen from the air and from the bodies of dead animals and plants joins with the other elements in the soil to nourish new plants, which in turn are eaten by humans and animals.

For all its familiarity, wood is a most remarkable substance. Although full of potential energy, it dis-

plays a stubborn resistance to any change in its character. Of all the innumerable forms of life on earth, only two microscopic species—the wood-digesting strains of funguses or microscopic vegetables, and microscopic flagellate protozoa—possess the means of utilizing wood as food. Of these, the funguses are carried into the interiors of dead trees on the feet and bodies of carpenter ants, while the protozoa inhabit the bellies of termites. Together, they share the burden of returning to the soil, in usable form, all the wood that dies on the face of the earth.

Cellulose, the major component of wood, is a compound of carbon, hydrogen, and oxygen; three of the four most important elements in the natural cycle. In order for these elements to re-enter the cycle, it is necessary that this cellulose should somehow be reconverted into usable forms of these elements. Every tree that grows must eventually die, and unless the dead wood were somehow returned to the natural cycle, the whole process would come to a full stop. Every dead tree might remain standing as a monument to its own existence. Since the rest of the natural cycle would presumably continue, trees would keep on growing and drawing sustenance from Nature until they died, but on their death there would be no way of completing the cycle. Thus it is possible that, but for the lowly termite, the earth might be uninhabitable.

From this grim possibility, the humble termite, reviled, feared and detested, works unremittingly to preserve us. Neither knowing, nor greatly caring, that their noble mission to complete the cycle of elements on earth is misunderstood by the lords of creation, the termites go forth in the danger-fraught sunlight, to replenish the earth with their indispensable kind. ❀ ❀

REQUIEM FOR A GENTLE MAN

*For you who loved all green things growing
who turned and smoothed the earth
and did the careful sowing
of flower and tree, of squash and runner bean,
may Heaven be green.*

*For you who loved the wild,
may all wild things—
the silent-footed deer, the fox,
small fluttering wings,
all life upon your somewhere star,—
come to your call and touch . . .
and may your Earth joys double
where you are.*

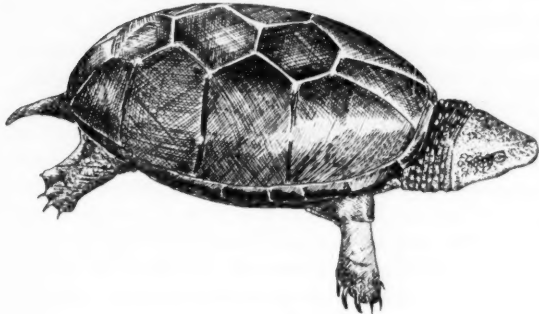
Elma Dean

Turtles

By E. LAURENCE PALMER

Illustrations by Hope Sawyer and E. M. Reilly, Jr.

*This is the ninety-ninth of NATURE
MAGAZINE's special educational inserts.*



Common Mud Turtle

THERE is a story to the effect that a desperate rural postmaster, faced with determining the postal rate on a box of turtles, finally exclaimed in frustration, "Turtles is insects!" and determined the necessary postage accordingly. Of course, his rating as a zoologist in this case would have been rather poor. Turtles, like snakes, lizards, and alligators, are reptiles. Their body temperature approximates that of their environment and, like the fishes, amphibians and their fellow reptiles, they are considered as being cold-blooded vertebrates.

To some of us, probably, turtles are little shell-protected animals sold in pet shops and sometimes inhumanely painted for sale as souvenirs. To others, they are surprise catches by fishermen, or creatures like armored tanks resting in the sun on a log, close to a pool of water. To a few, a turtle may be a fearsome creature in a farm garbage barrel being fattened to serve as the basis of a delicious soup. In our modern travel, turtles commonly appear momentarily as our car flashes by them on the pavement, and it is quite possible that we can measure our own character by our decision to run them down, avoid them, or to remove them from danger whenever possible.

Some turtles seem to be active in the brightest weather. Others may be nocturnal, while still others favor the transition periods of dusk and dawn. Some spend practically their whole lives at sea or in the water, coming ashore only in the dead of night to lay their eggs, usually at high tide. Others thrive in moist woods and grasslands, or even in the garden. A few have demonstrated an ability to live in deserts and other dry environments. With all these differences of habitat and behavior, it is

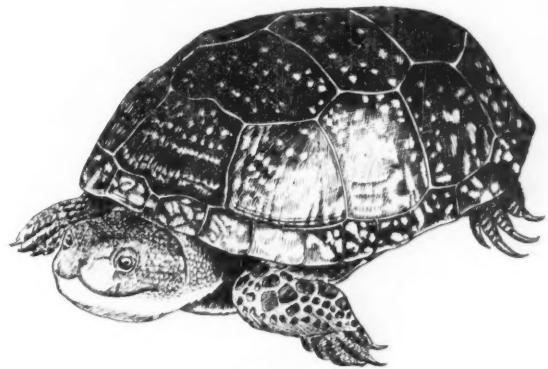


Leatherback Turtle

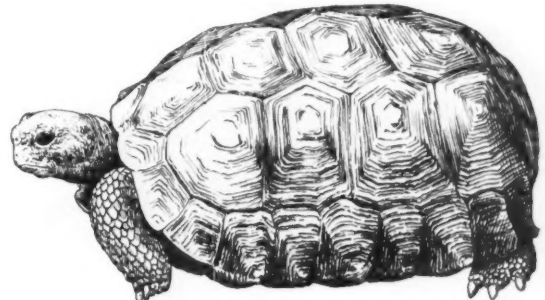
natural that turtles should vary considerably in structure. They do, although relatively little.

In the average turtle, the body is encased in a shell. The upper shell is known as the *carapace*; the lower as the *plastron*. The ribs are usually consolidated with the bony part of the carapace. In soft-shelled turtles, there is a leathery, flexible covering.

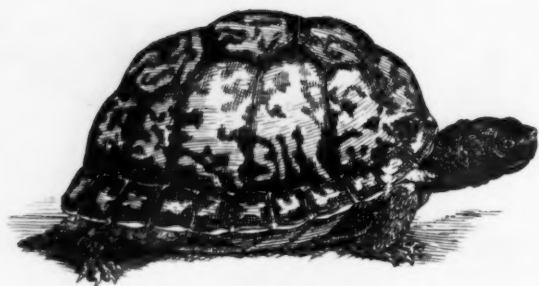
In many turtles, the hard covering serves as a means of protection against enemies. In some cases, the shell is hinged and can be closed tightly. In other species it provides relatively little protection. Generally, the turtles with the soft parts well protected are docile, while those not well protected are likely to be belligerent.



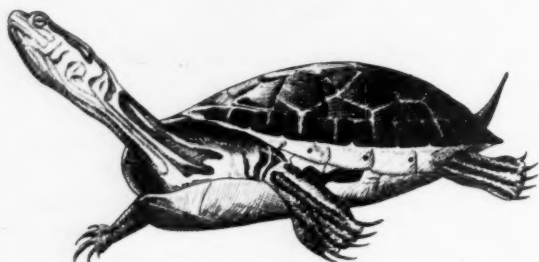
Blanding's Turtle



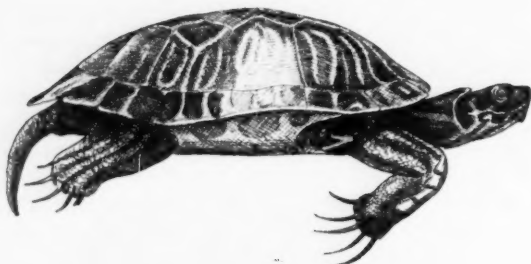
Desert Tortoise



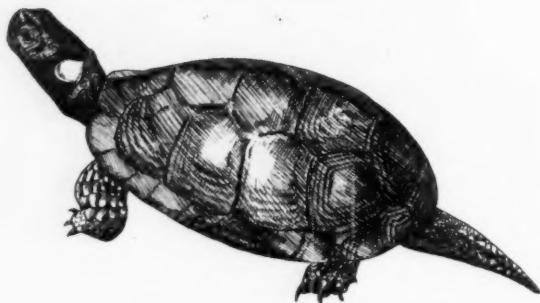
Box Turtle



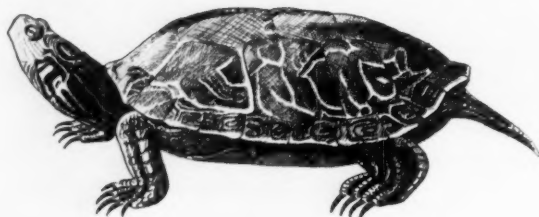
Chicken Turtle



Hieroglyphic Turtle



Muhlenberg's Turtle



Common Map Turtle

Turtles can safely remain under water for long periods of time. Some remain submerged all winter. In some species, this prolonged submergence is possible because of the presence of thin-walled sacs that serve as "cloacal gills." In many, however, submergence is possible because of the slow respiration and the reduced need for a fresh air supply. Turtles do not have teeth, but their jaws have horny sheaths. While some snakes and some lizards may lay eggs, others apparently may give birth to living young. All turtles are involved in the laying of fertile eggs which, unlike the eggs of more primitive fishes, have shells, and thus are prevented from drying out and being destroyed. Like lizards, and unlike snakes, turtles can close their eyes with the help of lids. Many turtles can effect further protection for their soft parts by withdrawing into the protection of the "shell."

Except in the Arctic and Antarctic, there are few places on earth that can not and do not support some sort of turtle. More than 4000 species of living turtles are known to science, and fossil forms are known back to Permian time. While turtles may seem for the most part to be rather low on the scale of intelligence, there are those who believe that box turtles may have the intelligence of rats in solving the problems of mazes.

As is the case with most animals, there seems to be a relationship between the structure and function of the parts of turtles. Turtles, like the soft-shelled turtles that lie flat in mud in the shallows, do not have high shells like the land turtles. Their flatness makes it possible for them to operate unseen in extremely shallow water. Turtles that lie in wait for their prey frequently have an exceptional ability to strike their prey without moving their bodies. This requires a neck that is extensible, as in the chicken turtles and snapping turtles. Many of the reptiles feed on hard-shelled mollusks, and find the possession of strong crushing jaws advantageous.

Turtles that normally take their prey from beneath may have eyes located at the tops of their heads, in contrast to the many whose eyes are on the sides of the heads.

The legs of these animals vary from enormous strong flippers, like those of the sea turtles, to stump-like legs such as are found in the desert tortoise. The reason for such differences is evident when we examine the environment in which each of the animals lives.

The presence of claws on the feet of turtles tells several stories. Animals that must dig in the earth to build nests, or that must hide under ground in hibernation or for protection must have claws suitable for digging. Male turtles that must hold the females during the mating act find that the possession of long claws on the front feet are most convenient. Sometimes there is significance in the number of claws on the feet of the species, and on those of the different sexes. The length of the tail in the two sexes also is significant, as is the length of the lower shell and the concavity and rear margin of the shell. Once the reasons for these variations are recognized, their significance frequently becomes obvious even to the most casual of observers.

Coloration also is frequently of importance to these reptiles. In general, the under sides of turtles are much lighter than the upper sides. Enemies looking from beneath a turtle towards a bright sky are less likely to see the animal if the under side is light-colored. Similarly, the upper side may be dark, as is the bottom over which the animals move. If the water is likely to be rippled above a turtle, species may have mottled backs, as in some of the soft-shelled turtles; and not a few turtles that live over bottoms where algae abound commonly have their backs overgrown with algae similar to that on the bottoms. It is not natural for a turtle to have on its back a sign reading "Souvenir of Sandy Beach," and where such a sign is painted on the turtle it should be removed, if possible, since it may interfere with the normal functions of the back.

These reptiles may appear to lack emotion, but some of them, like the leatherbacks, are noted for the sounds they make when injured or disturbed. Some other turtles give off gentle sounds during the courtship period, and many will make hissing sounds when they are suddenly disturbed. The common expression "the song of the turtle" found in *The Bible*—and as the name of a successful play—has nothing to do with the subject of this insert, since it refers not to turtles but to turtle doves, and to the songs of these birds in spring during the period of courtship.

Turtles yield a number of substances of value to man, and play an important part in the biological balance of their environment. They serve as food for man both as adults and as eggs. The eggs are cooked, preserved, candied and otherwise treated for human consumption. In general, it seems to be wasteful of a resource to use the eggs of useful animals, and it would seem that where a species is not abundant the use of turtle eggs as human food should certainly be discontinued. The flesh of many turtles is good either in soups or eaten as such. Formerly, it was the custom of some ships—especially whaling vessels—to carry turtles for use as fresh meat. The animals could be kept alive with less care than required by most animals. Many of the huge turtles found on the Galapagos Islands found use in this way, and their numbers were accordingly reduced.

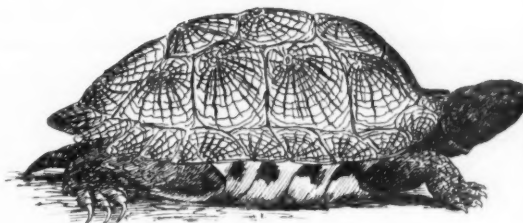
Men frequently have been inexcusably cruel in their treatment of these animals. Probably the most inexcusable act in this connection was the custom of building fires on the backs of living hawksbill turtles to make it easier to remove the scales for use as "tortoise shells." Fortunately, the value of this product has been greatly reduced not only by a change in styles but by the synthetic production of substitutes of equal beauty and in some respects of greater usefulness.

When their interests or freedom are interfered with, some turtles can defend themselves effectively by biting or by flailing with their free-swinging flippers. Others are practically helpless in the face of their enemies.

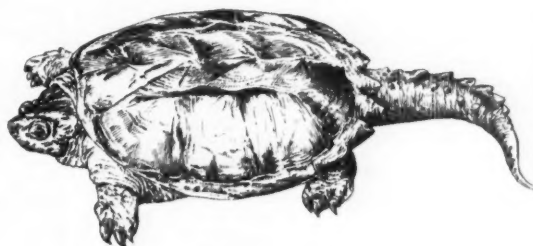
The animals have many enemies from the time they are eggs until they reach maturity. Mammals like skunks, hogs, raccoons and men (Continued on page 32)



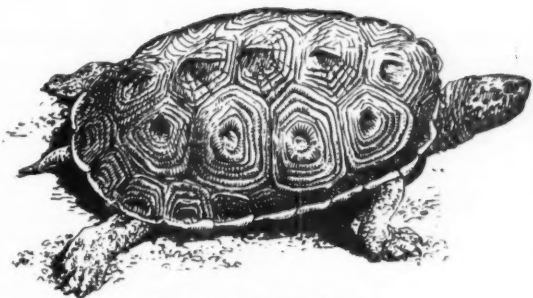
Loggerhead Turtle



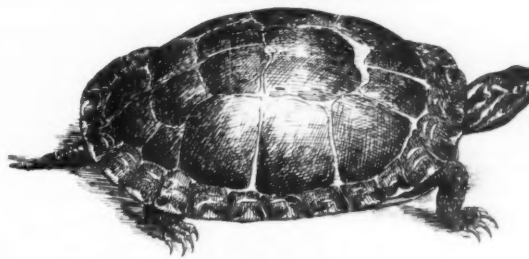
Wood Turtle



Snapping Turtle



Diamond-backed Terrapin



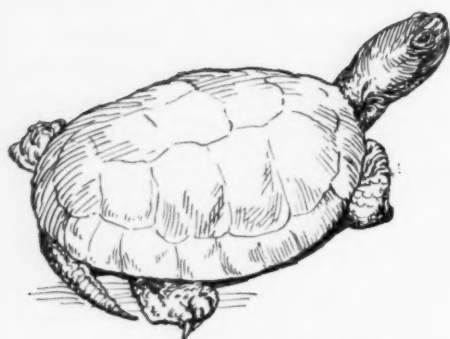
Painted Turtle

COMMON NAME SCIENTIFIC NAME	SNAPPING TURTLE <i>Chelydra serpentina</i>	COMMON MUD TURTLE <i>Kinosternum suburum</i>	WOOD TURTLE <i>Clemmys insculpta</i>	PACIFIC POND TURTLE <i>Clemmys marmorata</i>
DESCRIPTION	Total length to more than 3 feet. Average upper shell, 1 foot; lower shell, 8 inches. Under parts not well protected by shell. Back with 3 broken ridges of coarse scales and border row, giving notched appearance to rear. Turtle fattened in swill barrel reached weight of 86 pounds. Related alligator snapper may exceed 200 pounds in wild state.	Length, to 4.8 inches. Shell, yellow to olive to brown or black, in adult without keel. Head, medium. Male usually with larger head and jaws, heavier tail with blunt nail on tip, and with rear notch on under shell deeper than in female. Under shell covers soft parts; front and rear sections hinged to central stiff bridge and may be used to close shell.	Shell, to 9 inches long. Upper shell keeled, rough, with concentric ridges on scales. Lower shell basically yellow, with dark blotches. Upper jaw usually notched. Throat and lower limbs, usually yellow to orange. Head, medium. In male, tail in front of anus twice that of female. Male, with concave lower shell and longer claws.	Upper shell, to 7 inches by 5 $\frac{3}{4}$ inches; lower shell, 6 $\frac{1}{2}$ x 4 $\frac{1}{2}$ inches. In male, vent is beyond outer margin of the shell; female, inside that limit. May weigh to 2 pounds. Upper shell, low, wide, almost smooth, olive to black, with each shield with many yellow-brown to black dots and dashes. Under shell yellow, and in male, concave. Young, with keel on back.
RANGE AND RELATIONSHIP	Family Chelydridae. From southern Canada to Ecuador, but east of the Rockies. Alligator snapper from northeast Florida to central Illinois and Missouri and south to southeastern Texas and the Gulf Coast. Common or Loggerhead Snapper, throughout United States east of Rockies. In lakes and streams, mostly over muddy bottoms or on nearby land.	Louisiana to Illinois and east along Gulf and Atlantic coasts to Connecticut but not in western Virginia, Ohio or northern Pennsylvania or New York. A western relative, <i>K. sonoriense</i> , is found along Mexican border and adjacent territory in California, Arizona, New Mexico and western Texas. Common in ponds and slow mud-bottomed streams, April to November.	Ranges from Nova Scotia to Virginia, west to Wisconsin, central Iowa but not found in Ohio, Indiana or southern Michigan. Found in almost any environment, wet or dry, from dense woodlands to quiet pools, lakes and streams. Closely related to Muhlenberg's turtle, Pacific pond turtle, and to spotted turtle described in fourth insert.	Pacific Coast from southwestern British Columbia to northwestern Lower California with two subspecies overlapping in San Francisco area; not east of California or central Washington-Oregon area. Highly aquatic in preferences and known to live in brackish and even in salt water. It is probably the commonest turtle to be found in its range.
REPRODUCTION	Males may fight prior to mating. Breeds April to November. Eggs laid May to October, in to 2 or more clutches in South, laying to 80 eggs, white, to 1 $\frac{1}{4}$ -inch spheres. Known to lay 52 eggs at 2 per minute in nest in dry earth or sand, usually within 75 feet of water. Hatch in about 81 days but may delay until spring if eggs laid in late season. Young, to 1.1-inch shells.	Mates under water, in early May, with 2-5 eggs, each 1.4 inches in diameter, laid in earthen nest to 5 or more inches deep. May through July. Young may hatch in September or October and may winter in the nest. The three subspecies differ considerably in disposition and to some extent in habits, the Florida form having a larger head for the male and being more vicious.	Courtship begins with elaborate dance and whistling by both sexes and ends with mating under water, perhaps at end of a number of days of effort. To a dozen or more eggs are laid in a nest under ground, usually in June and in after-noon; hatch in September to October into young with 1 $\frac{1}{4}$ -inch shells, usually without yellow under-markings.	Eggs may be laid from April to August but mostly in June-July, in clutches of to 11, hard shelled, elliptic, to 1-2/5 inches long, in nest in open field, sandy bank or hillside, exposed to sun but eggs buried. Hatch by sun's heat into nearly round young whose scales may have concentric ridges. In 10 years, may develop shell length of to 5 $\frac{1}{2}$ inches.
ECOLOGY	Food about 50% plant matter. May eat to 1 small game fish a day. About 30% of food, fish; and 20% carrion, mostly eaten under water and captured by sudden lightning-like strike with head. May lie buried in mud except for head. Usually calm in water but vicious when out of element. May hibernate October to May and wander to $\frac{1}{2}$ mile, and may live to 20 years.	Feeds largely on under-water animals, probably largely snails. A Florida specimen kept 51 hours at 38°C., and at 37°C. humidity lost 22.2% of its weight. Gives off a most offensive musky odor but this is hardly as bad as that of the musk turtle. Probably serve essentially as scavengers but are kept frequently as aquarium pets in spite of odor.	Food is highly varied, including plants, their leaves or fruits, and insects of land or water, large or small; may include fish but not abundantly. Turtles may hibernate in mud at bottom of waterway or may aestivate in mud at approach of season of drought. Animals usually solitary except at mating time or when forced by weather to limited suitable areas.	Shy turtles that escape quickly into water when disturbed, most active in evening or early morning. May hibernate during winter months, particularly in northern part of range. Food may be aquatic plants such as lily-pads, and insects and other animal life, living or dead, found under water. Must be submerged to swallow.
ECONOMY	May destroy ducks and game fish but probably not to reputed extent. Pond may support 2 per acre, often concentrated during hibernation. Common scavenger which has been used, by attached floats, to locate drowned persons. Skunks and man are greatest enemies. Men use traps to capture them. Two Michigan trappers, with 60 traps, averaged \$1000 a year for 3 years.	In the mud turtles <i>Kinosternon</i> the forward and rear portions of the under shell are hinged and movable. In the musk turtles <i>Sternotherus</i> , the forward free portion of undershell is shorter than the rear portion and not movable, or only slightly so. Both are commonly taken on hooks baited for catching fish. Mud turtle lacks paired whitish lines on sides of head of musk turtle.	Probably are the most intelligent of our turtles, may learn to come at feeding time if kept in house, to sleep in definite place and, by actions, to ask for food. Are active in daytime and usually inactive at night. May learn to follow a definite route to satisfy wants. Have been considered to have intelligence equal to that of a rat. Harmless to man's interests.	Have a commercial value as food, and because of this have been extensively and probably unwisely trapped by turtle-hunters. Since animals may congregate in great numbers, their destruction in an area is sometimes too simple and harvest should be regulated if survival is expected. May serve as scavengers.

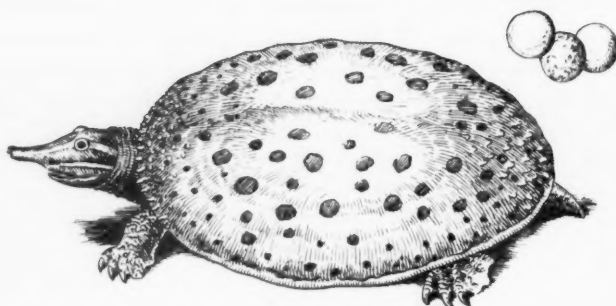
MUHLENBERG'S TURTLE <i>Clemmys muhlenbergi</i>	BLANDING'S TURTLE <i>Emys blandingii</i>	BOX TURTLE <i>Terrapene carolina</i>	DIAMOND-BACKED TERRAPIN <i>Malaclemys terrapin</i>	COMMON MAP TURTLE <i>Graptemys geographica</i>
Shell to 4½ inches long with side margins more or less parallel or spreading to the rear. Rough and mottled, but not spotted. Usually distinguished readily by large orange blotch on side of head to the rear. Shell is feebly keeled, dark brown to black. Scales show concentric markings on back but turtle is a rather ordinary looking animal except for orange on head.	Shell, to nearly 10 inches long, flattened oblong. Upper shell black, with hundreds of small, pale yellow, round or oblong dots. Lower shell, flexible at middle, permitting closing to hide soft parts, notched to rear and with each large shield with a dark blotch at center or to the rear. Lower jaw and throat, bright yellow. Upper jaw, beakless and notched in front.	Upper shell, normally to 5 inches long but may be to 8 inches, to 2½ inches high. Lower shell covers under side of body and is hinged permitting closing to front and rear. Back, with inconspicuous ridge. Thick bony scales, dark brown to black, with yellow spots, streaks or blotches. Head, small, with small overhanging notched or unnotched beak.	Upper shell of female, to 7½ inches; of male, to 4-4/5 inches. Conspicuous because of raised concentric ridges on each scale. Shell sides, about parallel. Head and neck, without yellow stripes. Head, relatively large, that of female being large, with more rounded snout; also female has shorter tail and a deeper shell. Suggestion of a ridge down the back.	Upper shell, to 11 x 8 inches; the lower, to 10 x 8½ inches. Adult with keel down back. Height, to nearly 2 inches. Back olive, with network of light lines. Under shell, yellow to white and for most part unmarked. Head is large particularly in female and jaws are strong. Head has elongated spot on side not attached to other markings.
Found from Rhode Island through southern New England to western New York and western Pennsylvania and south through New Jersey and western Virginia and North Carolina, being found at elevations of to 4200 feet in North Carolina. Commonly associated with tamarack-sphagnum type of territory.	Through New England except Maine, south to New Jersey and west to eastern edge of Nebraska. There are two species in the genus, the other being found in eastern Europe, western Asia and northern Africa. This species is largely terrestrial but is usually found near streams or other waterways. Not normally too abundant in any area.	Eastern United States from Maine to Georgia and west to Tennessee and Illinois, but with closely related species extending range to Yucatan and Mexico, occasionally found at elevations of 4000 feet. In South, there are usually 3 toes on hind feet; in North, 4. Related ornate box turtle found in arid Texas, New Mexico, Arizona and northern Mexico.	Found in salty or brackish bays along Atlantic Coast, from Buzzard's Bay to Florida and represented by two subspecies, the southern coming north to Cape Hatteras and the northern south to North Carolina, Delaware and Chesapeake Bay. There is also a related species, with 3 subspecies. Found in marshy tracts over mud bottoms. Shell length is legal length.	Western border of New England south to eastern Virginia, to western West Virginia southwest to southern Arkansas, eastern Oklahoma and Kansas, eastern Iowa and Minnesota but not in northern Michigan or Wisconsin. Three related species in limited areas in Louisiana (<i>oculifera</i>), southern Alabama (<i>pulchra</i>), and northern Florida and Georgia (<i>barbouri</i>).
Males have heads that are deeper and wider, tails that are longer and thicker, undershells that are more concave and with narrower rear notch than do the females. The claws of the front are also heavier and the snout longer in the males. Eggs to at least 4 may be laid in June, but not necessarily all at once. Young are proportionately wider than the adults.	No obvious sex differences. Breeding is preceded by courtship pursuit of female by male, usually in water, and it may take place from March to October. Nest is built in form of hole, to 7 inches deep, in earth, and to 11 eggs are deposited there. Eggs, 1.5 x .86 inches. Nest built in about an hour and egg laying lasts about ½ hour. Young 1.3 by 1-2/5 inches, dark.	Males may have concave lower shells and pink or bright red irises while females have dull brown or dull red irises. Breeds from spring to fall. Fertile eggs may be laid 4 years after breeding. Eggs to 8, with thin, white, flexible shells, 1-2/5 x 4/5 inches, laid June-July or late autumn, in nest. Hatch, spring to November, to 1¼-inch young, mature at 5 years.	Female lays fertile eggs for years after 1 mating but only 4% are fertile after 4 years, may lay 1 to 5 times a season. Eggs white, 1-2/5 x 4/5 inch, hatch in 90 days into young with 1-1/10 inch shells. Males mature in 4-9 years, with 3-3½-inch shells; females in 4-9 years with 5-inch shells. Young individuals resemble the females in many characters.	Females larger and more aggressive, with shorter tail, larger head, with upper shell more rounded to rear. Females mature with shell to 7½ inches long. Courtship from April to October. Laying mostly in June in early morning. Hatching in August to September. Eggs laid in 2 layers in nest, to ¼ mile from water, numbering, per clutch, to 16.
Food may be swallowed under water or on land and consists of plants and animals. Readily adjust to confinement and learn to eat variety of foods including large berries and insects, so probably may be considered as omnivorous. If confined, should have ample dry area available. Are highly sensitive to climatic extremes, favoring temperature of 68-75°F.	May be active even under ice as early as January. Usually hibernates on land in mud, under trash. Is a timid turtle, with a pleasant disposition and does not seem to resent handling. It was undoubtedly more abundant in prairie country before settlement and agricultural practices interfered with its activities. Food is largely animal matter like insects and crustaceans.	Gentle, retiring animals that are wholly harmless. Build nest in late afternoon or early evening in 3-5 hours. May live more than 40 years and may stay in radius of few hundred yards. Feed on plant material, including mushrooms; also insects, slugs, worms and snails. Protected by shell from enemies such as skunks, rats, flies, but suffer in fires.	Food of wild animals both plant and animal, the latter including crabs, snails and worms. In captivity, are fed chopped fish, clams and insects, feeding preferably under water. In experimental farms, young are usually freed at 8 months of age because of expense of procuring food. Hibernation in bottoms of streams begins with advent of cold weather.	Food is largely molluscs which are crushed by strong jaws or may include crayfish and large insects. May be annoyed by insects when basking and may be parasitized by leeches attached to soft parts. Highly gregarious in basking areas and whole mass may drop into water when one becomes disturbed. Favorite habitat is in sloughs attached to rivers, lakes.
Of no great economic importance and with low reproductive capacity, cannot be important except to turtle fanciers. May make excellent pets but the long periods of hibernation and aestivation may make them highly seasonal in their activities and may make their captors feel that they are not doing well.	Considered to be good food for man and has been sold in Ohio markets to such an extent that its abundance in natural habitat has been greatly reduced. It is probably of no damage to fish hatcheries except that its food is approximately the same as that of many game fishes and so it may be considered as a competitor.	May hibernate a few inches under soil surface below frost line and may aestivate in hot weather in mud. Make excellent pets requiring little care but should be fed and watered adequately. Drink with head under water. Are edible but in many States are protected by law because of use as insect and slug destroyers. May injure some crops like tomatoes.	Possibly the most expensive of all world turtles and one of the most popular as food for man. While we know how to raise these animals in captivity and they have a high market value, it seems unlikely important in the near future for many reasons including the slow reproductive capacity, the disease situation, the ability of young to escape confinement.	Because of nervous nature do not make good captives and if confined may try endlessly to escape. Flesh is considered palatable but not superior and the animals are found for sale in markets. Possibly may serve as intermediate hosts for parasites of other animals but they do destroy many molluscs that are known reservoirs for parasites that are harmful to man.

COMMON NAME SCIENTIFIC NAME	PAINTED TURTLE <i>Chrysemys picta</i>	HIEROGLYPHIC TURTLE <i>Pseudemys floridana</i>	CHICKEN TURTLE <i>Deirochelys reticularia</i>	DESERT TORTOISE <i>Gopherus agassizii</i>
DESCRIPTION	Shell low, broad, to 7 inches long and 5½ inches wide. Lower shell, to 6¾ x 5½ inches, not hinged. Neck, not too long. Back smooth, without keel or notched rear margin, shows no longitudinal wrinkles. Tubercles on upper jaw parallel to margin. Lower shell yellow, marked variously in the subspecies.	Upper shell, to 11½ inches long, and lower nearly same length. Along middle of crushing surface of upper jaw is a high, strongly toothed ridge. Lines on top of head are usually unbroken. Lower shell is yellow or orange, but marginal shields show blotches enclosing light areas on lower margins. Claws on forefeet long.	Length of shell, to about 10 inches but relatively narrow and depressed, about twice as long as wide, although closer estimate would give width as 65% of the length, and height 40%, with head and neck to 80%. Upper shell, with narrow longitudinal wrinkles, not notched behind and only a suggestion sometimes of a keel. Olive brown, with large light net pattern.	Upper shell more than twice as long as the shell is high, with upper and lower shells about equal in length. Scales, with conspicuous concentric markings. Hind legs are cylindrical and commonly held erect. Forelegs, with thick bony scales on front surface. Toenails of front feet are short and heavy. Top of head is scaled conspicuously. Upper shell, about 9½ inches long.
RANGE AND RELATIONSHIP	Found from coast to coast through southern Canada, south through eastern Washington and Oregon, Idaho and eastern Colorado and Wyoming, to central New Mexico and southeastern Arizona, northeastern Oklahoma, southern Kansas and Missouri, down the Mississippi to the Gulf, through Tennessee and eastern Georgia and northeastern Florida and between.	Eight subspecies range from Virginia to central Nebraska, eastern Oklahoma and central Texas, into Mexico and in territory on to the Atlantic and Gulf Coasts. Hieroglyphic subspecies found in northeastern Louisiana through most of Mississippi, western Alabama, western Tennessee, western Kentucky and southern Illinois and Indiana.	Ranges from eastern Texas into southeastern Arkansas and along Gulf and Atlantic coasts to southeastern Virginia. Found throughout Florida and touches on extreme southeastern Oklahoma. Most closely related to the genus <i>Chrysemys</i> . Is in the same family, the Emydidae. There is but one species in the genus and apparently no recognized subspecies.	<i>G. agassizii</i> is found in desert of southeastern California, southern Nevada, southwestern Arizona and northwestern Mexico. Related <i>Berlandier's</i> turtle is found in southern Texas and adjacent Mexico and the gopher turtle, <i>G. polyphemus</i> , ranges along the coast from eastern Texas to southern South Carolina.
REPRODUCTION	Mates in April or later. Eggs, 5-8, smooth, white, glazed, soft-shelled, blunt, egg-shaped, laid May to July, in nest in soft soil, in woods or open country and covered with soil. Some believe incubation may last 1 year but young are found before normal egg-laying time. Young to 1x1 inch when hatched, to 2½ inches at 1½ years, to 3½-inch breeders in 4½ years.	Nests in May and June but particularly in June. Eggs, to 20, elliptic-ovate, pinkish white, with softish shells, with granular surfaces, 1½ by 1-1/3 inches on average, sought as food by snakes, bears and raccoons. Nails of the males are much longer than those of the female on the forefeet, and tail is thicker and with vent farther to rear.	Males commonly have smaller, narrower shells than females and longer tails. Breeding and egg laying may take place at almost any time of the year. Nests are made frequently in ploughed soils near waterways but little seems to be known specifically about the building of the nest, the incubation of the eggs or growth. There may be to 15 eggs, about 1½ by 1 inch in size.	Male has longer tail, more concave under shell and somewhat larger head. Mate in May, with males fighting each other for mates. Males grunt. Nest built in June and to 6 eggs laid. Eggs, about 1-3/5 x 1-2/5 x 1½ inches, white, with thick hard shells, buried in sand, hatch in about 17 weeks into young, 1¾ x 1-4/5 inches reaching length of 2-4/5 inches first year.
ECOLOGY	Docile animals that make popular pets. Feed on a variety of plants and animals. May feed on land but prefer to feed submerged. Thrive on beef, earthworms, lettuce or fish. Food habits apparently have not been studied exhaustively in the wild state but it may serve as a scavenger at times like many other kinds of turtles.	Seen commonly sunning on logs in sloughs of streams particularly in warm sunny weather. Young animals eat almost anything but adults feed mostly on water plants or other available plant food. May be kept well fed in captivity with little trouble. It may become active during short relatively warm spells even in winter.	Has a highly varied diet and in captivity will eat almost anything, but in free state probably eats more animal than plant matter. It is known to eat crayfish and tadpoles. It is probably active at night. It favors temperature of 70-77°F. In captivity it may be fed mussels, snails, fish, earthworms, raw meat, and should have a float on to which it may crawl.	Food, largely plant material, fruits and vegetables. Do little to protect selves except withdraw into shell; harmless, favor temperature of 85-95°F. Have been known to move 20 feet in a minute or to 5 miles in one day. Can be taught to accept food from the hand. Some relatives known to have lived for 152 years. Man is probably worst enemy.
ECONOMY	Flesh is considered as palatable but the edible portion is too small to justify effort to get it except in emergencies. They have been sold to markets at \$1 per dozen which obviously does not suggest high finance in connection with marketing them but even this may have been a purchase by an uninformed buyer who did not recognize inferior food value.	Has been sold regularly in markets within its range and is rather famous for use in making excellent soups. Being a plant eater, it does not figure too prominently in the biological balance of the area in which it lives.	Has been sold in local markets and is considered to be a highly edible species. It is probably eaten by natives throughout its range. It does not make a good pet because it may bite readily and hisses in an unfriendly way when first approached. Once adjusted to captivity it may not be unduly offensive.	Useful as food but too interesting to be exterminated and ordinarily should not be destroyed. Must have dry environment to survive and prosper. Some huge relatives in parks are known to be able to carry children on their backs. Have long ancestral history.

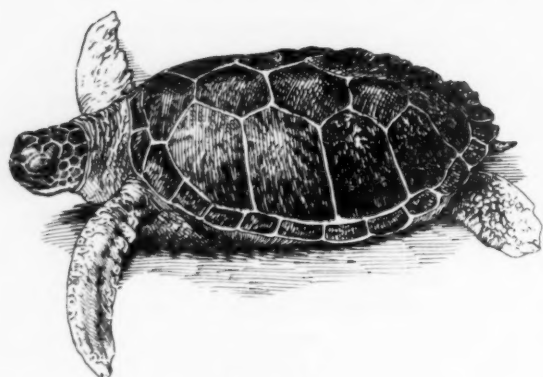
GREEN TURTLE <i>Chelonia mydas</i>	HAWKSBILL TURTLE <i>Eretmochelys imbricata</i>	LOGGERHEAD TURTLE <i>Caretta caretta</i>	LEATHERBACK TURTLE <i>Dermochelys coriacea</i>	SOFT-SHELLED TURTLE <i>Amysa ferox</i>
Shell covered with large, bony shields. Back, with no longitudinal ridges. 4 pairs of side shields and shields of back overlapping only in young. Single pair of shields on front of head. Color, mostly brown or shaded with olive. White or yellowish beneath. Back shell, to 40 inches long. Weight, to 850 pounds. Strong vertical ridges on inner side of upper jaw.	Upper shell, to 32 inches long, somewhat heart-shaped, with coarse scales, with scales forming the margin almost sharp enough to cut. Scales have beautiful tortoise shell coloring when seen with transmitted light. Head chestnut brown. Under shell yellow, often with black markings. Legs brown above; yellow beneath, and powerful.	Shell, long heart-shaped, being in outline somewhat concave in front and uniformly oval to rear. Length, to 7 feet and width to 4 feet. Weight, to 1600 pounds. One measured 12 feet from fin tip to fin tip. Limbs two-clawed in Atlantic species and 1-2 clawed in the Pacific subspecies. Two pairs of large shields between the eyes. Five pairs of scales on side of back.	Total length to 8 feet or more, possibly more than 10 feet; total width, to more than 6 feet; total weight to 1600 pounds. A 1000-pound leatherback had a width from flipper tip to flipper tip of 10 feet. Usual size much smaller than above. Back is smooth, scaleless, with black skin, with 7 narrow longitudinal ridges and 5 ridges down the under side.	Length of back shell to more than 17 inches. Back shell leathery and flexible, with bluntish tubercles along the front edge; surface, with various indentations and elevations. Nostrils crescent-shaped, as contrasted with round in spineless soft-shelled turtle. Snout long and drawn out. Basically gray to brown, often with dark spots. Under surface, uniformly white.
Found on shore or in seas along Atlantic from Massachusetts through West Indies being commonest marine turtle of Bermuda. On West Coast, known from San Diego to southern Lower California. Usually is within 35° of the Equator. Two subspecies recognized; the Atlantic <i>C. mydas mydas</i> and the Pacific <i>C. mydas agassizii</i> .	Two subspecies, one in Atlantic from Massachusetts to southern Brazil and the other in the Indian and Pacific Oceans from Japan and Baja California south to Madagascar to Peru. Not known south to Cape of Good Hope so the two are kept separated. Are strictly marine animals and their habitat is the open sea except at breeding time.	Atlantic subspecies <i>caretta</i> known from Nova Scotia to Rio de la Plata in Argentine and from Scotland to Rio de Oro in West Africa. In South Africa, this form is replaced by the Pacific subspecies <i>gigas</i> . Pacific subspecies known from southern California to Chile and south to South Africa. There seems to be an overlapping of characters in meeting area.	Two recognized subspecies; <i>coriacea</i> , the Atlantic, and <i>schlegelii</i> , the Pacific, with differences that cannot be adequately presented here. The Atlantic ranges from Nova Scotia and the British Isles south to Mar del Plata, Argentine and the Cape of Good Hope; the Pacific, from Japan and British Columbia to New Zealand and Chile. Obviously favors warm seas.	In 6 subspecies; <i>A. ferox</i> in all States except Oregon, Washington, Idaho, Utah, Virginia, Delaware, New Jersey and the New England States. The related spineless species <i>mutica</i> is found in South Dakota, Nebraska, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Tennessee, Ky., W. Va., Pa., Ohio, Ind., Ill., Mich., Wis., Iowa, Mo. and Ark.
Breeds any time of year, nesting on sandy shore, but may vary at different times of year, in different places. Nest built at night usually on spring tide, to 10 feet wide and to 2 feet deep. To 200 or more 1.9-inch eggs laid, possibly 2 to 5 times a season; hatch in 47-52 days. Young add ½ inch to shell and to 1 pound a month first year. Female matures at about 10 years.	Mate near shore, presumably near the beach where the nest is built. In Florida area, breeding and egg laying take place from April through July. Believed that three clutches of eggs may be laid by a female in a season. About 150 eggs laid, each about 1½ inches in diameter. Incubation period apparently is not known.	Along Atlantic Coast of America from Virginia to Florida. Breeding takes place from April to August with greatest activity in June. Usually most egg laying is done during latter half of a flood tide. Nest is above high water mark, is dug with hind flippers in sand to a depth of more than 2 feet. Eggs are laid to 12 per minute to total of about 150, more than 1¼" in diameter.	Male more slender to rear and with longer tail than female. In Florida, egg laying takes place from December through January, according to some, but there are records as late as June. Female comes ashore, builds nest to 150 feet back from water, lays to 80 eggs at 3-foot depth. Eggs about 2½ inches in diameter, but vary in size, with thin, brittle shells.	Females larger than males. Mating takes place in water and has not been carefully observed. Eggs are laid in nests opened in sandy shores from March to July, with to more than 20 eggs in a clutch, each about 1 inch in diameter and spherical. Nest may be 4 inches in diameter and 5 inches deep. Young 1 inch, circular; to 7 inches in 5th year and breeds first in 6th.
Food almost exclusively marine algae, particularly those that are succulent. Young may eat more animal food than do the adults. May sleep at sea. Captive turtles known to have added 50 pounds weight in 9 years. Tail of males extends beyond tip of extended flippers but in the female only to edge of upper shell.	Food is both plant and animal matter, including the poisonous Portuguese man-of-war. In captivity, may feed on fish and meat and do well. Meat is by some reported to be poisonous but to others it may be a delicacy. Eggs are eaten freely by man either dried, smoked, fried or otherwise prepared.	Incubation is for 1-2 months. Food of young is largely animal matter including clams, conchs, oysters, sponges, jellyfish and sometimes turtle grass, <i>Zostera</i> . Animals of course are harmless to man and do not compete with him for a common food supply. Conservation practices could save the animals if they were applied.	Food probably is both plant and animal matter judging from stomach contents. May be dangerous with flailing flippers and with bites. When caught, may give cries of pain or rage if hurt, giving groans, roars, bellows and wails according to different interpretations. Pacific animals may be larger than Atlantic animals, one reaching weight of 1902 pounds.	Food probably largely animal matter, such as molluscs, crayfish, minnows, frogs and earthworms. Food is swallowed whole. Jaws powerful, particularly suited for crushing in the males. Can strike accurately and suddenly but if held by tail cannot strike effectively. Animals are essentially aquatic but sun themselves on shores, escaping into water as necessary.
Of great economic importance as food for human consumption. Supply becoming limited largely because of overharvest and destruction of nests and eggs. This turtle is a renewable natural resource that could be restored by reasonable behavior, since the reproductive capacity is tremendous. Females less than 40 pounds should be left to mature.	May be of value as food but greatest value came from the scales that had wide use in the arts. They were often removed from the live animals by building fires on the backs of the turtles, but this must have been tremendously cruel and unjustified. Fortunately plastics and chemistry have given us superior substitutes and the value of tortoise shell has dropped.	Flesh is inferior as food for man. The shells are inferior to those of hawksbill turtle and yet the flesh and eggs are eaten. Eggs are made into a strange candy or into a sausage-like food. Sometimes the animals are made into an oil that is used as a varnish. Shells have been used as small buoys for boats.	Oil extracted from skin is used as varnish. Eggs are eaten by man and flesh is considered everything from delicious to poisonous and tough. These turtles are so few in number the world over that it would seem that they should not be destroyed and their eggs should be allowed to develop. Incubation of eggs in Ceylon reported to be 55-65 days.	These turtles are edible and are found for sale in markets. They may injure humans by their bites and may destroy some useful and rough fish and compete for food with useful fishes. Their food value probably exceeds the damage they do. May be caught in traps, nets, or on baited lines. Body temperature may vary from 33.6 to 84°F., slightly above that of environment.



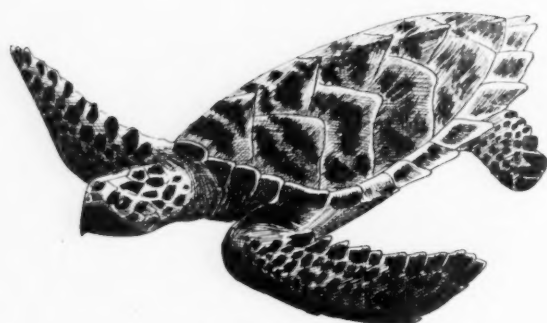
Pacific Pond Turtle



Soft-shelled Turtle



Green Turtle



Hawksbill Turtle

(Continued from page 27)

spoil many turtle nests by digging up the eggs and eating them. Against this the turtles have little defense. The larger carnivores like bears are known to kill and eat adult turtles. The reptiles have numerous external and internal parasites that interfere with their freedom of action. Leeches attach themselves to the soft parts of their bodies where there is no protective shell, and some flies whose larvae are carnivorous are known to lay eggs on the exposed soft parts of some of our land turtles.

Turtles may turn the tables, of course, and become effective enemies of other animals. With some justice, wildlife managers find it important to trap snapping turtles from ponds where fish and ducks are to be raised.

When we measure the food value of the turtles themselves, they are perhaps justified in eating some valuable animals in order that they may themselves survive.

Turtles and their relatives play some part in the lore and mores of some groups of human beings. For example, the shells of turtles are used frequently by Indians in making rattles used in rituals.

I have failed to find any reference to turtles in *The Bible*, which seems strange because the animals must have been known to those who contributed to the production of the book. In Aesop's Fables, we find two stories dealing with turtles or tortoises. One, dealing with the tortoise and the eagle, preaches a moral against using an enemy for self-advancement. The other is the better-known story of the hare and the tortoise, and the celebrated race that was won by the slower animal.

Alice in Wonderland tells us of the Mock Turtle that is used in mock turtle soup, but does so in a frivolous manner. The turtle that danced on the shore also comes from the story of the adventures of Alice.

Shakespeare, in *Romeo and Juliet*, uses a turtle shell hung on a wall in an apothecary shop to give an appropriate atmosphere. In other literature, turtles are associated with virtuous women who carry their houses on their heads, their "chappel" in their heart, danger in their eye, their souls in their hands, and God in all of their activities. It requires some imagination to recognize the full meaning of this pearl of wisdom. Similarly, a statue of Venus, by Phidias, shows the lady with one foot on the shell of a tortoise to signify the two great duties of virtuous women—to keep house, and to be silent. It is possible that with the passage of time this significance may have been lost, and that virtue can nowadays find expression through other media.

As for me, I prefer to read Joel Chandler Harris and his Uncle Remus stories to build up a whimsical appreciation of turtles. Better yet, I like to read about Gilbert White's turtle in his *Natural History of Selbourne*. Still better is Dallas Lore Sharp's classic experience of getting *Turtle Eggs For Agassiz*, in his essay by that name. This essay was chosen as one of the best to appear in *The Atlantic Monthly* in the first fifty years of its publication. It should be read by everyone interested in natural history, in good writing, or in Louis Agassiz. If you have not read it, take time off and do so. ❀ ❀ ❀



Kit foxes are among 1080 victims.

Poison and predator control programs are governmental activities the wisdom of which we have long seriously questioned and generally deplored. The public knows little about these policies and their impact on wildlife populations. Nor is it generally realized how large is the "bureaucracy of poison" or how considerable the funds expended on such activities. We are, therefore, pleased to be able to present this article—at much more than our customary length—because we regard it as highly important. The author has performed a valuable and objective task in assembling this information. Every statement is carefully documented. *Editor.*

Uncontrollable "Control"

Wildlife the victim of deadly, chain-action poisons

By MARGUERITE ANGELO SMELSER

Photographs by Robert Laushman unless otherwise credited

SUCH is the current passion for poison that yearly, upon millions of American acres, Federal and State agencies are spreading tons of grain and meat impregnated with the most spectacularly deadly poison known to man: Sodium fluoroacetate.

Commonly called Compound 1080, this all-killing poison was developed by chemists during the second world war when red squill was hard to get. So extremely toxic is 1080 that minute amounts kill, and it possesses an annihilative chain action destructive to all wildlife. "Unfortunate that 1080 was ever discovered," writes a noted research biologist.

Man also is highly susceptible to this tasteless, odorless white poison; it has caused human deaths. Taste it, breathe it, and although it may work slowly and you get the best medical aid, you are doomed. *There is no known antidote.*

In the wake of Compound 1080's dramatic discovery have followed widespread tragedy to wildlife, and almost unbelievable official incompetency, complacency, and concealment.

Although Compound 1080 is used ostensibly for so-called predator control—in itself more often than not questionable—and for rodent control, this dastardly

poison plays no favorites. Its chain action kills much of the wildlife in large areas. Many scientists realize the danger, but are unable to change official policies. Poisoning is big business.

Whereas this article deals mainly with the disastrous use of 1080 in California, Arizona, Colorado, Nevada, New Mexico, Montana, Washington and Oregon, this indiscriminate killer is in common use today widely over the United States.

Some idea of the extremely deadly nature of Compound 1080 can be gained from records of the American Medical Association. Babies ranging from 6 months to 2 years have died from merely chewing on cups that had contained 1080 bait. In a masterly understatement, the U. S. Fish and Wildlife Service warns: "A single teaspoonful of the poisoned water solution as used for rats (one-half ounce to the gallon) may be sufficient to produce the death of a child, and three times that amount could kill an adult person. In addition, 1080 possesses a high degree of secondary hazard. A single mouse killed with the water solution may contain enough poison to kill a full grown dog."

Dr. John L. George, when assistant curator of mammals, New York Zoological Park, prepared an excellent

report, *The Pesticide Problem*, published by the Conservation Foundation in 1957. Writing that 1080 is not safe for general use, he stated: "One ounce is enough to kill over 50,000 average size rats, and each dead rat would contain enough poison to kill a dog."

That a 1080-poisoned rodent can kill a dog is especially ominous to another canine, the coyote. Despite prevalence of the superstition (fostered by hunters and trappers and poisoners on the public payroll) that coyotes and bobcats are bad, there is probably in all ecology no fact that has been more often proved scientifically than the actual benefit of these animals to the wild in general and to stock raisers in particular. This knowledge has long been available to the officials who deny it, and who solicit appropriations of public money to keep them in the business of exterminating these helpful carnivores.

Dr. George is now employed by the U. S. Fish and Wildlife Service, where his extensive knowledge of pesticide hazards can be valuable. In his new capacity, he informs the author that the Service is moderate in its use of 1080. Dr. George writes that the Service personnel alone used 26,666 ounces of it in 1954. That, by his own figures, is enough to kill one billion, 333 million, 300 thousand dogs or coyotes!

Death from 1080 is certain and agonizing—and *there is no known antidote*, remember. Death also may be lingering. One of the human fatalities on record (records difficult to come by, and admitted by A.M.A. to be incomplete) is the case of a man who suffered 17 hours before death. Some wild animals die even more slowly and wander far before they fall; they and their vomitus to become in turn lethal bait to other animals, including birds.

Warnings by the U. S. Department of Health against the use of 1080 in solid baits have been disregarded. As far back as 1947, that Department cited a case where fifty hogs had been killed by 1080-poisoned bait.

Two eminent biologists, Robert L. Rudd and Richard E. Genelly, Department of Zoology, University of California, state that, among other alarming aspects of 1080, "There is little doubt that rodents killed by 1080 and later eaten by carnivores are responsible for the loss of many furbearers. . . . As long as mammal control depends on poisoned baits, hazard to other animals will be high. . . . It merits a full and impartial review."

No such "full and impartial review" is forthcoming. Whenever an investigation is made, it becomes a farce conducted "by the very men who put out the poisons and by their supervisors," writes Arnold Rieder, Repre-

sentative in the Montana State Legislature. "It's like sending a bank robber to investigate his own robbery."

Control programs are completely out of hand, but the directors of the programs either will not admit it, or do not think it worth doing anything about. These directors are the men who hold our wildlife welfare in the palms of their powerful hands.

One official device used repeatedly to side-track investigation is the soothing assurance that Compound 1080 no longer is being manufactured; hence objections are out of date. This misinformation has been spread so widely that the author time and again has met chemists and biologists repeating it and apparently believing it themselves. These are men whose very vocations should lead them to know better, and should move them to concern regarding the actual situation.

More than a year ago, the Agricultural Commissioner, who is one of the copious spreaders of 1080 in the author's home County of San Bernardino, California, unqualified-

ly wrote: "It may be said that Compound 1080 is no longer being manufactured." Queried four months later, the Tull Chemical Company, Inc., of Oxford, Alabama, claiming to be the sole manufacturer of Compound 1080, announced tersely that not only was it still in business, but it now had sales representatives in twenty-three foreign countries. As recently as mid-September, 1958, Tull mailed a price list in response to inquiry.

So hush-hush has been the use of 1080, with its dangers, that the general public has had little knowledge of what is going on. But with the scandalous poisoning of thousands of geese, pheasants, and other animals in Washington, Oregon and northern California during an attempt to control a serious mouse infestation in 1957 and 1958, the facts are be-

ginning to come to light.

A one-man information bureau in exposing the danger to wildlife, domestic animals and humans implicit in the use of 1080, the cyanide gun and certain other poisons widely used in "control" is Lester Reed, for 17 years an official trapper. He was also a poisoner for the U. S. Fish and Wildlife Service—until his conscience overcame his desire for a regular pay-check. Mr. Reed resigned his official job in October, 1957, and now devotes his life to informing people that much wildlife will be destroyed if they do not demand a stop to the 1080-poison programs.

Already, in areas where a few years ago wildlife was fairly plentiful, this skillful outdoors man and his equally skillful companions find little sign of even coy-



Lester Reed, ex-Federal trapper and poisoner, saw beyond a job and a pay check.

A heap of 140 dead birds lies outside headquarters building at Tulelake Refuge in California. Examination showed poisoned grain in the crops of each.



PHOTOGRAPH BY OTTO ELLIS

Three dogs belonging to Wayland Potter, Prescott, Arizona, lion hunter, are victims of 1080-poisoning.



PHOTOGRAPH BY WAYLAND POTTER

otes in thousands of miles of travel and search. This bears out Dr. Durward Allen's prophecy in his book, *Our Wildlife Legacy*, written when he was a biologist with the U. S. Fish and Wildlife Service: "Widely spaced 1080-injected carcasses are deadly baits to the far-ranging brush wolf, and its extirpation in large regions is now but a matter of time."

Let it be stated now that officials in government agencies employing this deadly poison claim that those now sounding the alarm are "misinformed," or "fanatics." Or a "few faddists," as the National Agricultural Chemical Association recently dubbed the hundreds of thousands of people aroused over the widespread use of certain dangerous insecticides manufactured by Association members.

The government officials also deny there is widespread and indiscriminate slaughter by 1080, claiming that "extreme caution" by "experts" is exercised in the placement of 1080-baits, and that it is "selective"—killing only coyotes and rodents. These statements are serious falsehoods, and can be proved to be such.

Since the author may be accused officially of "monumental misinformation"—as others have been who exposed the results of official poisoners' programs—it seems wise to state that in many months of study of the poison problem, the author has drawn on the technical knowledge of medical doctors, veterinarians, biologists, zoologists, naturalists, wildlife workers, and on the experience of official trappers and poisoners, as well as on communications with top men in the government agencies using Compound 1080. Documentation for every statement is on file.

It is worse than unfortunate that the writer must accord the anonymity of the confessional to some biolo-

gists, and others in important places, who acknowledge the 1080 poison programs are dead wrong and destructive. They are happy that someone is willing to arouse the public, but dare not do it themselves, feeling that somehow they would be in jeopardy if they are quoted in publications.

Neither Lester Reed nor anyone else will deny that the farmer needs control of rodents, and, at times, the elimination of individual carnivores. But for rodents, there are safer poisons with which to achieve results; for carnivores, there is the more biologically sound trapper-instructor-farmer system used successfully in Missouri.

Rodents and rabbits are the main diet of bobcats, coyotes, foxes and badgers. The trapping and poisoning of these so-called predators for monetary gain, whether bounties to individuals or appropriations for officials, has been a racket for many years. With carnivores killed off, rodent populations multiply and flourish, ruining untold acres of grasslands. This results in larger rodent and grasshopper poisoning programs, and appropriation of more millions of taxpayers' money to control these real pests. This is a tragic rat-race, as Colorado cattlemen found to their great financial loss. Now, to protect the few remaining "predators," the embattled ranchers guard their lands with a vengeance against Federal, State, and county trappers and poisoners.

Although in a negative manner the economic value of carnivores apparently is still recognized, it is lost in the job-giving, spectacular programs of "kill everything." In 1956, preparing articles on the value of carnivores, the author wrote the U. S. Fish and Wildlife Service for available information. Five pamphlets were received, each dealing with methods of killing carnivores. The author then wrote: "Have you no published data as to their value?" Exuding an injured air, the reply came that such value was recognized, but the Service had no money with which to print this type of information. (In addition to revenue from duck stamps, etc. the Service dips generously into the U. S. Treasury yearly for millions of your dollars and mine—more than 26 millions in 1958. Yet it has no money to publish data that might educate those destroying the Nation's wildlife—your wildlife and mine!) Its 1956 budget set aside nearly a million dollars for "control of predatory animals, etc."

In both State and Federal offices, letters questioning

the propriety of the so-called predator control, automatically go to the predator control branch. Try writing one! You will hear from some administrator of the control program who is interested only in defending and promoting his kind of work.

Now let us examine some of the allegations of those who are so interested.

When, in March of 1957, ex-poisoner Reed sent his pamphlet describing the indiscriminate destructiveness of the 1080-poison programs—published at risk of his job—to California's U. S. Senator Thomas H. Kuchel, together with evidence of the 135 dead deer found near 1080-poison stations, the Senator forwarded both to the Director, Bureau of Sport Fisheries and Wildlife, U. S. Fish and Wildlife Service, Washington, D. C. In reply, the Director wrote Senator Kuchel:

"It is common knowledge that matters of this kind are often grossly misinterpreted. It appears Mr. Reed is not fully informed regarding the *many safeguards* that have been established to govern the use of 1080 which are rigidly observed by both State and Federal users in California. Furthermore, he grossly over-rates the potential danger to humans. For example, *all the chemical used in the entire State of California would only be sufficient to pollute a small tank of water at a concentration sufficient to endanger humans.*" (Italics the author's).

The Director is the one who was grossly misinterpreting facts; and here is proof. Let us take first his "small tank of water." (The figures for concentrations of 1080 in baits are those furnished the author by official agencies. Since officials and departments and manufacturer give figures at variance with one another, the minimum concentrations as furnished by the U. S. Fish and Wildlife Service are used here.)

In California during 1957 alone, the U. S. Fish and Wildlife Service spread 8892 pounds of meat, each 100 pounds poisoned with 1.6 grams of 1080 (about one-twentieth of an ounce). It spread 15,175 pounds of grain, each hundred pounds poisoned with two ounces of 1080. The cooperating agency, the California Department of Agriculture, spread 327,257 pounds of grain, similarly poisoned.

If the 1080-manufacturer's estimate of toxicity of 2.0 mg/kg for 100 percent human mortality be accepted, the Director's "small tank" of deadly 1080-water solution would have killed, at a minimum, 1,378,022 Californians! This does not take into account the unavailable figures for 1080 used in this State by military installations and commercial pest eradicators.



One of the important rodent control agents, the barn owl, is eliminated when it eats small mammals that, although still alive, are dying from 1080 poisoning.

But the point is not how many humans could be killed by the 1080 used yearly in California. The point is: The figures show grossly misleading statements to a Senator to derogate one who, having been on the inside, is in fact too fully informed for comfort. Having been on the inside, ex-poisoner Reed knows the policies pushing the poisoning racket, and the falsity of claims of "official safeguards rigidly observed." In spite of intimidation, he exposes the whole mess.

Next, let us examine the official pronouncements as to "safeguards which are rigidly observed by Federal and State users."

Once 1080-bait is out of the poisoners' hands, there are

no safeguards humanly possible. "Pieces of solid bait may be carried by rats or mice into stored food or other places where they remain dangerous for an indefinite period," warn U. S. health authorities. In the field, birds and other animals carry baits long distances.

The manufacturer admits in Tull Bulletin No. 1, a complete reading of which chills the blood, "*Carefully collecting and burning all surface kill that can be located, still has not prevented accidental poisoning.* . . Residues or uneaten baits constitute a hazard to beneficial wildlife in the same habitat."

The 1080-grain poisoning of deer in California in 1955, and the scandalous 1080 and zinc phosphide poisoning of thousands of geese, pheasants and countless other animals in Washington, Oregon, and northern California in 1957 and 1958—as a result of widespread rodent "control"—show safeguards to be as absent as the proverbial hens' teeth.

After the 1957-58 fiasco was over, a biologist with the U. S. Fish and Wildlife Service wrote to a medical doctor, who was shocked by the tragedy: "Our Service has had no *legal* responsibility in the mixing, placing, or use of these poisons or baits provided the farmers by the Counties. We have furnished technical guidance when possible. . ."

This same public servant states in writing that the County Agricultural Commissioners—with whom the Service plays along in the poisoning racket—furnished to Oregon and California farmers, at cost, grain poisoned with Compound 1080 and grain poisoned with zinc phosphide in this one mouse project, *totalling in California alone 30 tons.* These 60,000 pounds of deadly baits were spread carelessly by farmers, with only token supervision.

So now the blame is laid on the farmers. There are your "rigidly observed safeguards!" These are the same



Burro meat is used at 1080 poison meat bait station. Black spots are bait dropped by birds or other animals.



The coyote, main target of the 1080 poisoning programs, has been proved a valuable friend to western stockmen.

officials, including the county agricultural commissioners, who assure solemnly of the "very restricted use" of poisoned bait spread "only by experts."

Caught red-handed in their hypocrisy, officials blithely pass the buck—and get away with it. They will continue to get away with it until an informed and alarmed public becomes not merely sad, but full of wrath about the dastardly poisons destroying our wildlife. In the cold light of facts, the salaried statements from the Bureau of Sport Fisheries and Wildlife can be chalked up to gross ignorance, or falsehood. In either case, further statements from that source must be viewed with suspicion, and the question asked: "Why are government officials in the poison programs so avid to defend them and continue them in the face of facts?"

With a courteous letter from the Assistant Director, U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Washington, D. C., came three pamphlets alleging "beneficial" effects of 1080 on fur-bearing animals other than coyotes. Again the "restrictive policy" in using Compound 1080 was stressed, with never a word about the tragic poisoning of wildlife so recently exposing this "restrictive policy" for the poppycock it is.

The Assistant Director gave assurance that the information in the pamphlets he enclosed is "factual and impartial." Witness the impartiality: One bulletin, "Published in the Interests of the Sheep Industry," is the cash-register writing of a "partner in the Idaho Chemical Industries, Inc."; a second bulletin was reprinted from *The National Wool Grower*; the third, reprinted from *The American Cattle Producer*. These are a Service biologist's opinion of impartiality, but which do not represent those of "working cattlemen," according to Montana Legislator Arnold Rieder and many others. Each pamphlet praised 1080, lauded the U. S. Fish and Wildlife Service, belabored the coyote, and denounced the groups being organized to protest the use of chain-acting Compound 1080.

The same old tired tank of water was cited to show how "small" an amount of 1080 is used yearly in Idaho—an amount which would undoubtedly make corpses of as many Idahoans as the same "small" tank could Californians.

"In the 10 years that the Fish and Wildlife Service has been using 1080 for coyote control, *no human sickness or fatalities have ever occurred*," reads the *Idaho Wool Growers* in August of 1956, quoting information it said had been prepared by the U. S. Fish and Wildlife Service research laboratory. Yet as far back as 1950, the U. S. Fish and Wildlife Service had admitted 16 human deaths!

Another statement of the wool growers is that Compound 1080 is "remarkably selective," killing only coyotes; that, in fact, it is a "great benefactor" of other furbearing animals, since they have "*almost doubled in numbers*, or (and here enthusiasm for 1080 runs hog-wild) *become even more plentiful*." Many wildlife men brand this "a damned lie."

"Why is it," this author asked Lester Reed, "that government officials and others hot in pursuit of poison panaceas, will allege—and their reports show—that animals other than coyotes and rodents are not killed by 1080-poisoned baits?"

Replied ex-poisoner Reed, "I can tell you from my own experience, and I have personal knowledge that other trappers and poisoners would tell you the same thing if they were not afraid of losing their jobs. When I first began to trap and poison, I listed all the animals I killed—and got called on the carpet. My supervisor admonished me, 'Report *only* the number of coyotes and bobcats killed; do not report other animals—it might bring public censure.'

"Furthermore, my supervisor ordered me to hide the bodies of these other animals and birds, including farmers' dogs, so that the harm I was doing would not come to the attention of the public." A federal trapper, quoted by Wallace Taber in "Poisoners at Work" (*Nature Magazine*, June-July 1949), stated that mink, marten, fox and badger were being exterminated by the 1080 coyote bait. The trapper gave figures to prove his point, figures he did not turn in to the Washington office for fear of losing his job.

Ask yourself, in view of the "no sickness or fatalities due to 1080" statement alone, how much dependence can be placed on the pocketbook propaganda of the Chemical Industries, Inc., and other groups with an axe to grind.

Another "assurance"—intended to lull but actually alarming—of government officials using Compound 1080 in both grain and meat baits, is this one by the Assistant Director, Bureau of Sport Fisheries and Wildlife: "The use of 1080 by the Bureau is confined to cooperative pest control projects in the more *sparsely populated portions* of the Western States" (although in the following paragraph he writes: "It is probable that some 1080 is used in every State by some state agency or commercial concern.") The Agricultural Commissioner for the author's home county wrote in a letter that the 1698 pounds of 1080-injected bait he used last year was mostly in remote areas.

"Remote areas," "sparsely populated portions." There, of course, is where our remaining wild animals live! When this fact was called to the attention of a public official, he replied: "Well, the supervisor of our poison program took a botany course in college."

A staggering lack of knowledge of the relationship between plants, wildlife, and humans is exhibited by the great majority of government officials—with a few notable exceptions—from county politicians to directors of agriculture and directors of wildlife agencies. Nor do these officials with power over this Nation's wildlife resources seem susceptible to learning from experience.

In 1955, the California Department of Fish and Game, and the Department of Agriculture, with a scandal brewing, had to admit the death of at least 135 deer found in areas where the agricultural department's rodent control crews had spread an abundance of 1080-poisoned grain. The following year, Lester Reed telegraphed protests to the Governor and to the Director of the Department of Fish and Game when he found improperly placed bait near a public camp ground, and an overabundance of bait generally. The Governor had an "investigation," and reported that everything was just ducky. Who conducted the "investigation"? The poisoners themselves, of course.

Then, late in 1957, more than 3000 dead geese, ducks, pheasants and other birds were counted in a 1080 mouse-control project in Oregon, according to Senator Richard L. Neuberger in the *Congressional Record*, June 16, 1958. And in the State of Washington, a like tragedy.

Yet three months later, the men playing God in California who, like their northern counterparts, had spent years poisoning, trapping, and shooting foxes, coyotes, bobcats, badgers, skunks, hawks, owls and other rodent-eaters, now got busy with their poison pots to meet their explosive mouse population.

The California Agricultural Department, the U. S. Fish and Wildlife Service and the farmers killed, by actual count, more than 2500 geese—among the dead, 40 of the rare Ross geese—according to the California *Tulelake Reporter*, of March 6, 1958, a newspaper located in the midst of the murder. "At least 3000 geese, and probably three or four times that, reportedly have been killed by poison bait in the Klamath basin," is the estimate by *Western Outdoor News*, a leading hunters' publication. None alludes to the countless other dead animals

not valued by hunters, but which are a necessary part of balanced wildlife.

If you have not already reached the conclusion that "official regulations" and "very restricted use by experts" are myths, and that official concealment is a fact, perhaps this may be convincing. The author discussed the "official regulations" with a highly respected California State legislator, an orchardist himself. "I, or any other farmer, can buy 1080-poisoned grain from the County Agricultural Commissioner for 40 cents a pound," he stated. (The author informed him he is being overcharged; the farmers up north got it for 2 cents!)

Furthermore, this legislator said that "half the orchardists around here have it in their backyards to poison rodents and rabbits." Yet the author has on file two signed letters from that legislator's county agricultural commissioner claiming that he does not supply 1080-poisoned bait to individuals. Official concealment?

These very officials who should be educating the public as to the value of wildlife are, instead, spending our own money to perpetuate indiscriminate poison and "predator" trapping programs to the tune of millions of dollars without heeding the scientific findings of biologists and naturalists, some of whom are in their own agencies.

A news item headed "Many an Argument," in the *Arizona Farmer*, June 10, 1950, quotes the complaints of Everett Mercer of the U. S. Fish and Wildlife Service, who "pays his disrespects to those who circulate 'wild stories' about the danger of 1080 to game, especially quail, turkeys, and javelinas," says the *Arizona Farmer*. Too much of the "education" end of the job, Mr. Mercer complains, has been left to the personnel of the Fish and Wildlife Service and the State Game Department. "He and his men had to put in too much time explaining and defending the program. . . The program had to be explained to literally hundreds of people to get permission to put 1080 on their property."

This author has many eye-and-ear witnesses' accounts of this official type of "explaining." A medical man who went along with a government poisoner on one such trip reported that the poisoner did not merely explain, he "argued and persuaded" until the ranchers gave in and signed the waiver, thereby permitting 1080 poisoning on their property and absolving the government agency of responsibility "against any and all claims arising out of accidental poisoning."

Lester Reed states that all indications from his extensive contacts with stockmen lead him to believe that the idea of coyote and other carnivore damage has had to be promoted in order to put over poison programs.

Dr. Allen, in his book mentioned earlier, wrote: "It is well known that popular reports in support of government predator control programs are not distinguished for being critically impartial."

In writing of this tendency to exaggerate and misrepresent the activities of carnivores, Ian I. McMillan, an influential central California rancher and author, writes in *California Farmer* for the month of Nov. 1951:

The badger, one of our native mammals near the verge of extinction, is a rodent-eater, and thus is one of the links in the vicious chain of poisoning.



"In my experience of some 30 years in raising cattle where coyotes and eagles were at times abundant, I have never suffered any such loss nor have I found any conclusive proof of such loss from predation as reported by others. Both these species will feed upon carrion and when found feeding on the carcasses of calves that have died from other causes, the loss is commonly attributed to whatever animal is found at the carcass."

The official departments, depending on repeated rodent-poisoning operations for continued government monetary appropriations, rejoice openly because 1080 used to poison rodents will, by its chain action, also exterminate coyotes—Nature's rodent control, and therefore the departments' competitors!

But hats off to one government official, a competent naturalist. While offering a defense of the agencies using the poisons, he admitted: "But you are right in your conclusions that there is much too much poisoning and too much trapping. Most of the animals cause little or no damage, be they bear or ground squirrel." Praise the Lord for this unusually honest, intelligent and forthright public servant!

The Honorable Arnold Rieder, Montana state legislator, a man of long experience with cattle and a vehement opponent of the 1080 poisoning programs, has written an excellent report, "The Coyote's Fading Howl." In Montana there have been placed some 2000 of the 1080-bait stations annually for ten years. The coyote is virtually eliminated, yet more poison than ever is being spread. "A wanton waste of money and natural resources," Mr. Rieder writes.

He places the blame on government poisoners—and "arm-chair" biologists—with the wool-growers as their political affiliates, as against independent biologists, "the naturalists, sportsmen, cattle-growers, and for the most part the general public."

Mr. Rieder writes that the 1080 poisoning—which he says produces the most brutal death known to man—"has been beneficial to the sheep people to a degree, but everybody else loses. . . I spent an entire winter where ten thousand sheep wintered in eastern Oregon. With-

out poison being used, not one sheep was lost to predatory animals, and there were plenty of coyotes."

He writes: "The Fish and Wildlife Service tell the cattlemen that the coyote is a great killer of calves. This really disturbs me, for I have followed cows and calves for many years and have talked with many old-time cattlemen about it. . . and anyone who knows the cattle business from a working cattleman's standpoint will not hesitate to tell you that the loss of calves to coyotes is so rare that it is not worth talking about."

The Montana legislator points out that the stomach analysis of 8263 coyotes showed that 80 percent of the animal items on the coyotes' menu are detrimental to man; thus the brush wolf is an ally. The small percentage of domestic stock he attributes—as do other authorities—mostly to animals dead of natural causes, which are simply there for the coyotes and birds to clean up.

Further, writes Mr. Rieder, "Whenever the balance of Nature topic is brought up at a discussion of coyote control, the Fish and Wildlife Service is quick to hand out a printed report called "The Predation Question—Facts Versus Fancies," which tries to impress that there is no such thing as balance of Nature, and cites a few cases where there were lots of coyotes and rodents at the same time. It does a good job of confusing the novice, or one who has not lived with the facts. . ."

You will recall that biologists Rudd and Genelly called for a "full and impartial review" of the dangerous 1080 poison programs. A typical example of how *not* to conduct such a review was furnished by an official farce just a year ago in the County of San Bernardino, California.

The County Agricultural Commissioner and the Board of Supervisors knew that a request was in the offing for a reappraisal of the predatory animal control officer's 20-year-old job under the Commissioner. This job was admitted (off the record) by one of the County Supervisors to be a political appointment, and was recognized by this official as being unnecessary.

So, to be prepared for this appraisal request by biolo-

gists, naturalists and conservationists concerned for the County's fast vanishing wildlife, the Commissioner held his own secret "appraisal" meeting. The tax-paying public that is forced to support the killer, and those vitally interested from unselfish motives, were unaware of such an occurrence until later, when qualified naturalists appeared before the Board of Supervisors to appeal for a genuine review.

Triumphantly, the Agricultural Commissioner produced the minutes of "just such an appraisal." Guess what! It was the unanimous opinion of his secret meeting: This County needs *four* county killers, instead of only one, to supplement the three State and Federal killers now destroying wildlife in the County.

What made up this "appraisal" group? Federal, State, and County predator control officials whose incomes are maintained and increased only by maintaining and increasing the official destruction of our wildlife; the actual trappers and poisoners themselves; the main local sporting-goods and ammunition seller; a couple of cattlemen with no knowledge of wildlife; two poultrymen; the County medical officer; the Agricultural Commissioner himself; and a representative of the Board of Supervisors. Their written expressions of admiration and loyalty for the County trapper and poisoner were positively touching!

The "appraisal" by this hour-and-a-half meeting was piously accepted as gospel truth by the county officials, with never a scientific survey of the county's wildlife in the 20 years of official killing, and with no cognizance taken of an outside agency's laboratory stomach examinations of thousands of the killers' victims—which examinations proved that the victims alive were actually beneficial to agriculture, to the taxpayers, to the hunters, and to wildlife in general.

In attendance at the secret "appraisal" meeting was Mr. H. Nelson Elliott, District Agent, U. S. Fish and Wildlife Service. He is among the officials who promote and foster the continued destruction of carnivores and insectivores. In the California Department of Agriculture's Annual Report for 1957, he attempts to justify the slaughter by the 87 official trappers and poisoners in California of 21,462 "predators" (not including the rare golden eagles and the endangered kit foxes). In one area, he claims "an estimated 60 lambs were killed by golden eagles. . . and instances of lamb killing by eagles also occurred in five other counties."

No evidence presented. No substantiation. A mere allegation intended to convince you by the official position, not the competence, of the man with a monetary interest in convincing you. This is an example of flagrant official disregard for even rare or doomed

species of wildlife. Naturalists and other authorities dispute the claim that golden eagles are a menace to livestock. Being carrion-eaters—as well as rodent and rabbit catchers—the few surviving eagles are being killed by 1080-poisoned animals, they are shot from airplanes, shot by the high-powered guns of the professional trappers, and have long been targets for unscrupulous gunners, who kill them just for the "sport" of it.

Mr. Elliott claims that his joint predatory control program now receives *Army funds*, and "valuable help" is given by the California Woolgrowers Association, the cooperating officials of the U. S. Forest Service, Bureau of Land Management, National Park Service, military installations, and the California Farm Bureau Federation, along with many others.

The 1958 Quarterly Bulletins of the California Department of Agriculture make no mention of the devastating damage to wildlife through its use of poisons early in the year. It reports that "zinc phosphide and 1080-treated grain were applied, mechanically, by hand and by air. One device made ground application up to 35 acres per hour possible." But reporting the great rodent damage to agriculture *in spite* of this magnificent ingenuity of modern destruction, it states: "The use of poisoned baits has been *too slow* to cope with the situation. Various experiments with other methods and improvements on present methods are contemplated!"

One out-of-State trapper, typical of others, writes: "I am with a fish and game agency using federal aid in predator control. Though this department does not use poison and knows

the harm it does, I have been seriously cautioned against saying anything against 1080. Our Department must maintain friendly relations with the Fish and Wildlife Service in order to hold its status as Pittman-Robertson affiliate."

This inter-service brotherly love is a fierce thing. When Lester Reed quit the U. S. Fish and Wildlife Service, he went to work for the California Department of Fish and Game—which at least does not use poison in its extensive and despicable "predator control." He naively hoped that with his firsthand knowledge he might persuade his new supervisors to dissuade his former supervisors from using poisons.

But he was warned that if he expressed opinions "in writing or otherwise," contrary to those of other agencies of the "integral family," he would be subject to discharge "even though you have been considered an excellent employee."

Reed neither kept his mouth shut nor his pen dry. His supervisors stormed, but he (Continued on page 50)



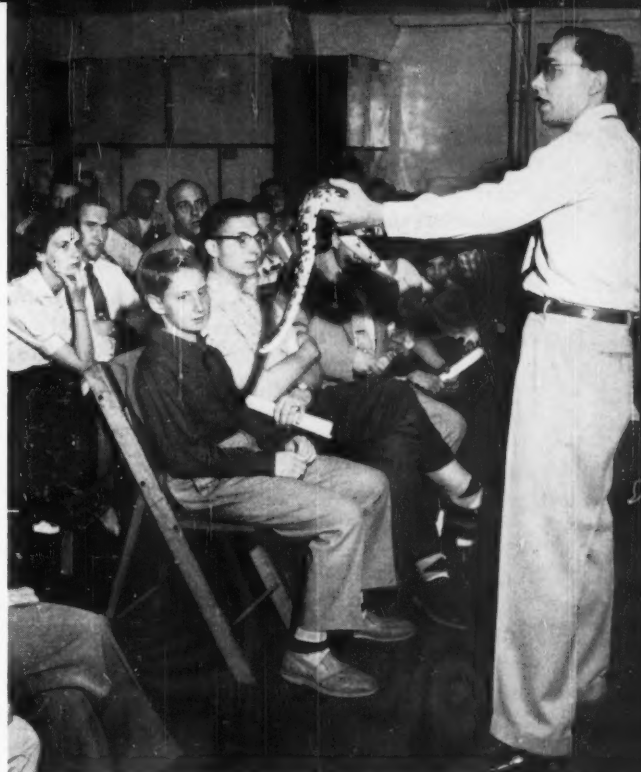
The skunk, a valuable insect control mammal, is another victim of the 1080 poison program.

Quaker City

"Herps"

By RICHARD A. CLEVELAND

A large pine snake, caught in the desolate pine barrens of New Jersey, is held by auctioneer Barry Rothman, chairman of the Philadelphia Herpetological Society, as the club members study the "merchandise" on the block before bidding. The imposing black and white reptile was sold for \$5.50.



IN THE warm, tropical atmosphere of the reptile house of the Philadelphia Zoological Garden a group of men, women and youngsters have seated themselves before a long table piled high with bulging cloth bags and glass jars. They chat as they gaze at the numerous aquariums and cages that surround them. The group waits patiently for the meeting to begin—a meeting of one of the country's most unusual naturalist's clubs.

Presently a man steps to the table, chooses one of the bags, opens it, and withdraws a large snake to open the Philadelphia Herpetological Society meeting.

"Who will open the bidding on this five-foot pine snake?" he says. A man offers two dollars and, acknowledging the bid, the auctioneer continues his bizarre spiel as the snake tightly encircles his forearm with its black and white coils. "This specimen was captured last summer in the Pine Barrens of New Jersey. It is now on a diet of live white mice and has been eating regularly once a week." The auctioneer looks around.

A woman seated with her husband near the front of the room cries "two-fifty" over the voices of other prospective bidders, who are discussing the "questionable" qualities of such an animal.

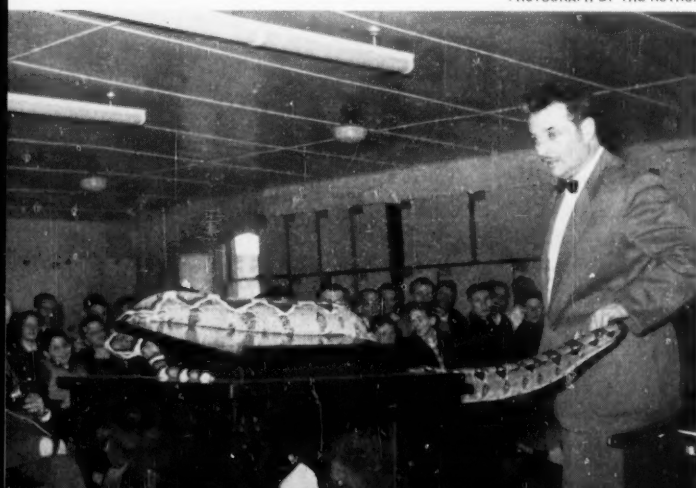
"The owner of this snake has told me that it has not bitten since its capture," says the auctioneer, giving the heavy reptile, wrapped around his arm, a quizzical look. "I hope he's right, but for every time he bites me the price will jump fifty cents." Over the laughter a bid of three dollars is heard.

With nary a fifty-cent bite from the "merchandise" the price climbs to five-fifty, where it stops with a bid made by a boy about thirteen years old. The boy leaps to his feet and makes his way to the auction table, where the snake is slipped into a cloth bag and turned over to its new owner. The youngster settles again in his seat, his dubious pet reposing quietly in the bag nesting on his lap. The strange auction continues.

To many, the prospect of deliberately keeping a snake as a household pet seems almost unbelievable. But to buy the creature at an auction surely borders on the fantastic. You may call it what you like, but to the 250 members of the society, the reptile auctions are the highlight of the club's meetings.

Why do these people study and collect such

PHOTOGRAPH BY THE AUTHOR



Carl Kauffeld, curator of reptiles at the Staten Island Zoo, is having a difficult time regaining the lectern from a reluctant boa constrictor that he brought to a meeting of the Philadelphia Herpetological Society. This large reptile was used in the curator's talk on the "personality" of snakes.

animals? With most, herpetology is a virtual obsession—an almost unexplainable one. Roger Conant, curator of reptiles at the Philadelphia zoo, who began bringing snakes and their kin into his New Jersey home as a boy of twelve, explained that the collectors want to know more about the cold-blooded creatures.

"Generally speaking," he said, "relatively little is known about reptiles and amphibians in comparison with other animals. The reason is that so few persons collect and observe them. There is now, however, a growing interest in herpetology."

One member explained that reptiles are "clean, quiet and require a small amount of space. Since they eat only once a week or so they don't need constant attention." With such redeeming characteristics, it would seem that cold-blooded animals should top the list of desirable apartment pets.

A woman in the society, who does not collect, joined the club only "to learn about reptile wildlife." The secretary to eight Girl Scout troops, she said she had seen turtles, lizards and snakes while on troop outings. "The girls began asking questions about them and I didn't have the answers."

The Philadelphia Herpetological Society was formed about six years ago by a handful of collectors. They believed that even in a civilization that, in general, takes a dim view of reptile collecting, there were others like themselves interested in herpetology.

The prospect of forming a herpetological club was put before curator Conant, who approved of the idea. Anxious that the club succeed, Conant offered the zoo's reptile house as a meeting place, and volunteered to act as an advisor to the members. In return he asked that the members confine their home collections to non-poisonous specimens. The reason, Conant said, should be obvious. "Being bitten by a poisonous snake is a very painful experience which could prove fatal. If this isn't discouraging enough, then the possibility of paying for expensive antivenin, doctor bills and hospitalization should be," curator Conant said.

The chairman of the society, Barry Rothman, made it clear that "keeping a venomous snake in a collection is like having a time-bomb in your living-room." The collector never will have any peace of mind worrying about whether or not he inadvertently left the cage of a rattlesnake, copperhead or cottonmouth unlocked, the chairman said. Mr. Rothman carries the unpleasant memory of having been bitten by a poisonous snake when he unwarily thrust his hand into a bag sent him labeled "harmless chicken snake" and pulled out a fistful of angry copperhead, quite a different animal indeed.



Above, Bill Wilson, reptile collector and member of the Society, has his hands full as he holds a pair of black rat snakes while wife Nancy uses surgical instruments to assist the pets with their periodic skin shedding. At the left, young Whit Wilson is "formally" introduced to a black rat snake by his mother. The couple early began to teach their son that harmless snakes need not be feared.



Rothman's wife, Norma, shares her husband's interest in herpetology. When they were married, they treated themselves to a singular wedding gift—a ten-foot boa constrictor. In their Philadelphia apartment they usually have a score or more cages of snakes and lizards, and visitors soon become accustomed to having such residents stare at them from atop coffee tables and bookcases. In their kitchen freezer, between the ice cream and the frozen vegetables, are packages of grasshoppers, crickets, fish, frogs and mice; blue-plate specials for many snakes in their collection. White mice are raised in the apartment to feed those snakes that will eat only "live" food.

Like many in the club, the Rothmans keep accurate records and charts of the feeding habits, growth, and idiosyncrasies of their charges. When a reptile in their collection dies, a post-mortem examination is performed to determine the cause of death. The results of the autopsy may reveal evidence of a contagious disease that, if it had spread, could have wiped out the entire collection. The value of such a program is evident.

The auctioned pine snake, bought by the excited thirteen-year-old, was one of three dozen snakes, eighteen turtles, eleven salamanders, ten lizards, twelve preserved specimens, and two mounted snake skulls sold at the meeting. One-fourth of the sale price goes into the society's treasury, while the balance is turned over to the member who supplied the animal for the auction.

A second part of the meeting is reserved for the guest speaker. He may be a college zoology professor telling the members of reptile collecting in Cuba, or a club member narrating his visit with a renowned herpetologist in another part of the country.

For the meetings in the reptile house (alternate gatherings are held in the city's Academy of Natural Sciences) head keeper Edward T. Endy and a few husky members roll several large terrariums to one side of the large room and set up folding chairs. People among the rows of glass-fronted cages may detect occasional movements from the tenants within. A cobra gracefully glides from under a log to its water dish. A frog jumps from the pebbled floor or its home to a rock, then sits motionless.

Next on the program is a question and answer period. Problems ranging from how to treat a snake with mouth rot, an infection of the gums, to inducing refractory specimens to eat are discussed. During these periods, the personal experience of one member may help the whole group. One member described two cures for mouth rot that had proven successful for him. Gently rubbing a penicillin ointment on the infection was one method, while the other was to swab the area with an antiseptic.

Snakes that refuse food may be persuaded to eat in many ways. An insurance man explained that he had success by putting a box with a small hole in it on the cage floor. The food is placed in the box where the temperamental snake is able to eat in privacy. Another collector suggested to the group that hog-nosed snakes, which normally eat only toads, may be tricked into eating strips of meat after the meat has first been rubbed with a toad. Jaws drop and incredulity shows plainly on the faces of the "outsiders" who attend the meeting when they hear to what extent the herpetologists will go to encourage their pets to eat.

Many of the members who desire specimens that can not be captured locally obtain them through reptile dealers, or by trading with collectors in other sections of the nation. A current price list from a dealer shows that a common iguana, a long-tailed, green lizard from tropical America, costs about two dollars for a one-foot specimen and about fifteen dollars for one five feet long.

South American boa constrictors, popular with the collectors because of their lustrous maroon and tan markings and docile nature, sell for about two dollars a foot. For a twenty-foot regal python from Malaysia, the dealer may ask more than 1000 dollars. Partiality also is shown for the domestic snakes of the king, rat, and indigo genuses. Among these are the beautiful red and orange corn snake; the delicate red, yellow and black banded scarlet king snake, and the tractable, blue-black

indigo snake that grows to about eight feet in length.

These species will subsist well on a diet of mice, rats or hamsters. The collectors usually find it more economical to breed the rodents than to buy them. If possible, the snakes are taught to eat "dead" food since rodents have been known to attack and kill a snake if the reptile does not make the first move. Probably the least popular with herpetologists are the water and garter snakes. This is due primarily to an abundance of the reptiles almost everywhere in the country, and a consequent reduction in their value. Another factor is the unpleasant defensive habit of exuding a strong, odorous fluid from their musk glands when the reptiles are handled.

William A. Wilson is a typical society member. Now twenty-four, Bill has been interested in herpetology since he was a boy. His collecting almost came to an abrupt end, however, when he married. Nancy, his wife, took a dim view of sharing their home with her husband's scaly friends. Bill explained that married men bent on maintaining a home reptile collection must first repeal the rule set down by their wives that "there will be no snakes in this house." The husband must prove to his spouse that snakes are not "slimy, repulsive creatures," as she has been mistakenly taught to believe.

Often the first snake brought home is DeKay's snake, a harmless tan and pink reptile that averages about ten inches in length. Seeing the little snake lying placidly in her husband's palm, the wife gradually begins to lose her fear of reptiles. Seemingly unnoticed by the distaff member, the specimens the husband brings home thereafter become longer and larger.

Nancy Wilson now has become so engrossed in Bill's hobby that when a "blessed event" occurred in their collection she took complete obstetrical charge. The occasion was the laying of thirteen eggs by a black rat snake. "Nancy practically acted as a midwife when the snake laid the eggs. She then put them in a jar in a warm place, and soon they hatched," Bill said.

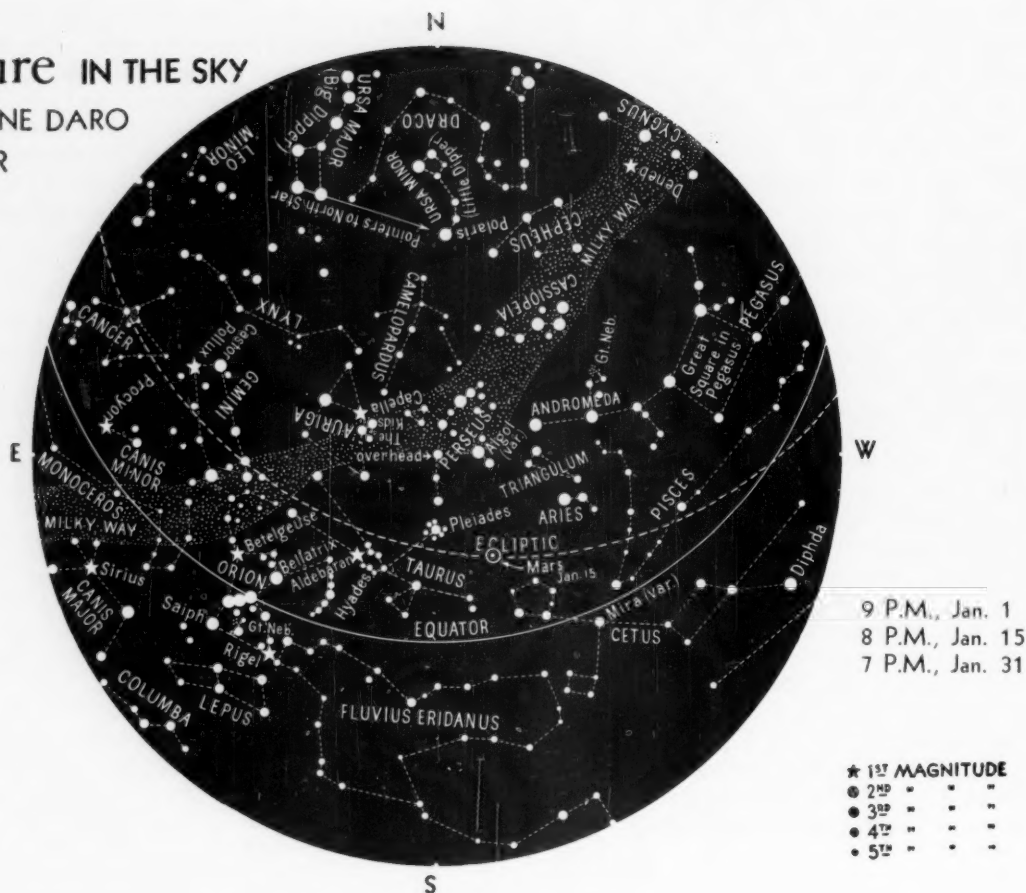
The herpetologist waits impatiently for spring and the first days when the mercury reaches the low seventies. When a warm sun touches the fields and woods, he begins his six months' collecting season.

The collecting gear consists of a snake stick, several deep cloth bags, a snake-bite kit, if poisonous snake territory is to be entered, and a few glass jars. The stick, fitted with an L-shaped metal hook at one end, is used for turning over stones and logs. In the capture of a snake the stick is employed to hold the reptile down while it is grasped behind the head. Most herpetologists agree, however, that the surest way to capture a snake is with your hands. Even if the collector is bitten by a harmless snake, the result is little more than a few minor scratches.

At the conclusion of each collecting jaunt the herpetologist must examine his wriggling quarry and make a difficult decision—which of the specimens will be kept in the home collection and which will be sold at the next auction of the Philadelphia Herpetological Society!

Nature IN THE SKY

By SIMONE DARO
GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

The Heavens in 1959

THE PAST YEAR was a busy one for astronomers and geophysicists. Professional activities were dominated by the commitments of the International Geophysical Year (IGY), which will have run its full course at the end of December, 1958.

Most spectacular of the experiments of IGY was, of course, the launching of a number of artificial earth satellites. After the two Russian sputniks of 1957, and the disheartening failure of the much-publicized Vanguard attempt in December of that year, the successful launching of the American Explorer I on February 1, 1958, did much for the relief of sagging spirits. The other successful launchings of the year (as of the date of this writing) were Vanguard I on March 17; Explorer III on March 26; Russia's Sputnik III on May 15, and

Explorer IV, whose launching took place on July 26.

The enormous size of Sputnik III (diameter 68 inches, length 140 inches, total weight 2925 pounds, including 2135 pounds of instruments) is primarily an indication of the powerful launching equipment that Russian scientists have at their disposal. American teams have concentrated particularly on the development of "miniaturized" equipment, so that the total weight of instruments inside a satellite is not necessarily an indication of its usefulness.

One of the most important results of satellite observations in the past year has been the discovery by Explorer III of the existence of a belt of intense corpuscular radiation at altitudes in excess of 600 miles above the earth's surface. It is interesting to note that the effects

of this radiation had actually been observed by Explorer I, but their intensity was so great that they had been interpreted as a failure of the equipment. The instrumentation in Explorer IV was designed for an intensive study of the belt. The angle of its launching was chosen to place it in an orbit that would bring it closer to the polar areas, in an attempt to determine the relationship between the corpuscular radiation and the earth's magnetic field.

The first three U. S. attempts to launch a lunar "probe"—that is, a space vehicle designed to reach the vicinity of the moon—have met with failure, although the second of these Pioneers penetrated nearly 80,000 miles into space before returning to earth. In all probability, one more attempt at launching a lunar probe will have taken place before the end of 1958, in early December, after this article has been set in type.

The total solar eclipse of October 12, 1958, in the Pacific Ocean was also the target of IGY research teams. U. S. ground parties, which had established their equipment on the Danger Islands, saw their efforts frustrated by a heavy layer of clouds during the total phase of the eclipse. Japanese teams located on Suvarrow Island had a clear view of the phenomenon and were able to carry out their plans for spectrophotometric studies of the solar chromosphere and corona, and photographic observations of the white corona. The U. S. Naval Research Laboratory successfully launched four Aerobee rockets into the path of the total eclipse in the upper atmosphere. The rockets were launched from the deck of a landing ship in the vicinity of Pukapuka atoll (one of the Danger Islands). One rocket was fired ten minutes before second contact, two during the total phase and one five minutes after third contact. Observations thus obtained confirmed previous theories that solar X-rays emanate from the sun's corona, while ultra-violet radiation originates in the sun's chromosphere.

Five comets made their appearance between January 1 and October 31, 1958. Two of these were objects never observed before, while the other three were expected returns of periodic comets. All were faint, and visible only through a telescope.

Although the IGY comes officially to a close on December 31, 1958, a few countries have decided to continue some of the observing programs for at least another year. This applies particularly to the operations in Antarctica, and to the various rocket programs.

Three eclipses will take place in 1959; a partial eclipse of the moon on March 24, an annular eclipse of the sun on April 8, and a total eclipse of the sun on October second.

In the eclipse of the moon of March 24, less than three-tenths of the moon's diameter will be covered by the shadow of the earth. The eclipse will be visible from Australia, most of Asia, the Indian Ocean, Europe,

Africa, most of the Atlantic Ocean, and from Antarctica.

The annular phase of the eclipse of the sun of April 8, 1959, will be visible in central Australia and on a few islands in the Pacific Ocean. The only land areas from which the partial phase of this eclipse will be visible are Australia, New Zealand, the southern Philippines, Borneo, New Guinea and other islands of Oceania.

The total phase of the eclipse of the sun of October 2, 1959, will begin at sunrise in Massachusetts. The track of totality will then span the Atlantic Ocean in a southeasterly direction, passing over the Canary Islands and Africa, crossing the Sahara Desert, the Sudan, Ethiopia and the Somali coast. The total phase will end at sunset in the Indian Ocean.

The partial phase of this eclipse will be visible on land in the eastern United States, eastern Canada, the Antilles, most of Europe, Asia Minor, and Africa except its southern tip.

Venus will be an evening star until the end of August, 1959, reaching its greatest eastern elongation on June 23 and its greatest brilliancy on July 26. On September 1, it will

enter the morning sky, and will be seen as a morning star for the rest of the year, reaching its greatest brilliancy on October 8, and its greatest western elongation on November 12.

Mars will be seen in the western sky mostly in the early evening for the greater part of the year. By the end of October, it will be too close to the sun for observation, and will enter the morning sky on October 30. It will rise about an hour before the sun by December 15.

Jupiter will be found in Scorpius during most of the year. It will be seen in the morning sky for the first few months. By the middle of May, it will remain visible all night. Toward the end of August, it will be seen in the western sky in early evening. In early December it will be too close to the sun for observation.

Saturn, in Sagittarius, will remain about two and one-half hours east of Jupiter during the whole year. Thus it will be in the morning sky during the beginning of the year, and will remain visible all night by the end of June. Toward the end of September it will be seen in the western sky in early evening, and will be lost in the sun's glare at the end of the year.

In the month of January, the New Moon will occur on January 9, and the moon will be full on January 24.

The earth will be at perihelion on January 2. This is the day of the year on which the earth comes closest to the sun.

Mercury will be a morning star. It will rise one and one-half hours before the sun on January 1, one hour before the sun on January 15, and will be lost in the sun's glare by the end of this month. It will be found low in the southeast, rather (Continued on page 47)

SIC TRANSIT GLORIA

*When tourists in their rocket ships
Are piercing Space on week-end trips
Along the scenic route to Mars,
Will billboards hide the silver stars?*

—A. Kulik

Nature IN THE SCHOOL

by E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Turtles in the School

ASIDE FROM GOLDFISH, IT IS POSSIBLE that turtles may be found in more school rooms than any other vertebrate pets. They swim endlessly in aquaria, crawl aimlessly in terraria, and hide shamelessly in the pockets of boys who like them as companions and as pets—and as instruments for causing alarm on the part of girls and teachers. Really, they have great value as agents of instruction if the teachers are willing to recognize their value. It is possible that the ninety-ninth insert in this issue of *Nature Magazine* may provide a means of making progress towards this goal.

Children who have pet turtles like to use them in "races" along a straight line, or from the center to the periphery of a circle. A few years ago a western Congressman climaxed an evening of New Year's celebration by staging a turtle race in the corridors of a dignified Washington, D.C., hotel. Later, the same legislator went fishing for turtles in an open-air aquarium in one of the southern States. He climaxed his career by jumping to death from a hotel window, but both he and the turtles were frequently in the news from coast to coast. Most of us remember the classic race staged by Aesop between a hare and a terrapin. Ignorance of the outcome of this race might well be an unforgivable sin, educationally.

Some years ago, I was largely responsible for an educational movie film on the snapping turtle issued by, and still available from, Encyclopedia Britanica Films; and I still remember my experience at that time with a scenario writer, who wanted to let dramatics outweigh truthful recording and reporting. I have long been disturbed over the willingness of educators to put into school programs and texts material about dinosaurs that none of us have ever seen alive, and omit consideration of turtles, whose behavior offers infinitely greater educational rewards.

Turtles and conservation

Turtles offer excellent media for developing some of the merits of wildlife conservation. In our literature and elsewhere, we make much of the fact that many of our valuable marine turtles gradually are being killed off. Some of the more valuable are approaching the verge of extinction, and yet little is done to protect the eggs of such turtles from destruction by curious folk. With the tremendous turtle reproductive capacity, it would seem that we should somehow reward those who protect turtle eggs and penalize those who destroy them. Think of the opportunities offered here for essays defending turtles against the results of ignorance!

If we recognize merit in the teaching of humaneness, turtles may offer us good object lessons. Turtles with painted backs found in pet stores must suffer because of the effect of the paint on the normal physiological exchanges that take place through a turtle's back. An understanding of the relatively slow response of these animals to stimuli has given many people the impression that turtles are of low mentality and sensitivity. When a turtle released from a baited hook is turned loose, and promptly bites at another baited hook, we have reservations in rating them high mentally. But psychologists tell us that some of these creatures rank with rats in their ability to learn how to solve a maze. We seem to think that turtles do not respond promptly to what is going on about them, but we forget the behavior of turtles on distant logs when they spot a man moving at a considerable distance. Here is an excellent opportunity for some young student to make original and useful observations, and to draw some valid conclusions from what he sees happen to local species of turtles.

The story of the turtle that at one time supplied us with tortoise shell is given in our chart section. It is worthy of study and elaboration, since it shows how the fate of a

species may depend upon the whims of fashion, and how a threat of extinction may be averted when chemistry produces a substitute superior to natural tortoise shell. This brings up the question of just what values we can assign to turtles and other forms of wildlife. We may read statements to the effect that all turtles should be removed from ponds on which ducks and valuable species of fish depend, yet, while drawing our conclusions, we are prone to overlook the food value of the turtle we may think should be destroyed. There is not a species of turtle listed in this month's insert that cannot be defended or opposed, once we are sure what we really want from a pond or other area inhabited by turtles.

Reproduction problems

The reproductive capacity of turtles presents us with problems as well as hope. It also calls for the recognition of some of Nature's niceties. The rather extraordinarily long time required for turtles to reach reproductive maturity, the interesting story of how long a female turtle may remain fertile once she has mated, the hazards of coming ashore to lay a clutch of eggs, and how the turtles meet natural and man-made hazards—or how they fail to meet them—all give us material to use in our studies of the animals. Many of the basic facts for such an investigation may be found in the charts of this month's insert. In carrying on these studies, look for data on rate of development of the young turtles, the length of incubation and the danger of misinterpreting the data we get on it, the varied behavior of a turtle starting to build a nest and the continuation of the task in spite of interruption once she has started to lay; all these things must be considered.

Food studies are always interesting, and in the case of turtles they are doubly so. A boy once came into my office to ask my advice about a house he was building for his pet turtle. When he asked me about the suitability of the dining room, I had to ask that we consider the kind of turtle he had. It then developed that he had not yet caught the turtle! Some turtles must eat under water, while others need not meet this situation. It is easy to assume that, since a snapping turtle can strike viciously with its head, it must feed wholly on animal matter. As a

matter of fact, such a generalization has been brought into question by careful study of the feeding habits of the turtle, by analysis of stomach contents, and by other observations. Recognition of this doubt may be useful in teaching the wisdom of reserving judgment until there is adequate data.

One of the more important aspects in the study of turtles by youngsters centers not on what we know about common turtles, but on what we do not know, and the opportunity to learn more through careful observation. Children are attracted to the water's edge throughout the world. Turtles perform some of their most important functions in the same ecological area. Possibly it is the teacher's function to see to it that the meeting of these two interesting animals on that shore is mutually profitable. Do not miss the chances to make it so.



Useful References on Turtles of the United States

- Blair, W. F., et al. *Vertebrates of the United States*. McGraw-Hill Book Company, New York. 1957. 819 pages.
- Carr, Archie. *Handbook of Turtles*. Cornell University Press, Ithaca, New York. 1952. 542 pages.
- Clarke, Robert F. *Turtles of Kansas*. Kansas School Naturalist, Emporia, Kansas. 1956. 16 pages.
- Ditmars, Raymond L. *Reptiles of the World*. The Macmillan Company, New York City. 1941. 321 pages.
- Lamson, G. H. *Reptiles of Connecticut*. Bulletin 54, Connecticut State Geological and Natural History Survey. 1935. 35 pages.
- Netting, M. G. *Amphibians and Reptiles of Pennsylvania*. Carnegie Museum, Pittsburgh, Pennsylvania. 1939. 29 pages.
- Palmer, E. Laurence. *Fieldbook of Natural History*. McGraw-Hill Book Company, New York City. 1949. 664 pages.
- Pope, Clifford. *Turtles of United States and Canada*. Alfred Knopf, New York City. 1934. 343 pages.
- Pope, Clifford. *Amphibians and Reptiles of the Chicago Area*. Chicago Natural History Museum, Chicago. 1944. 275 pages.
- Rodeck, Hugo G. *Guide to Turtles of Colorado*. University of Colorado Museum, Boulder, Colorado. 1950. 10 pages.

Savage, J. N. *Illustrated Key to Lizards, Snakes and Turtles of Western United States*. Naturegraph Company, Los Altos, California. 1949. 32 pages.

Schmidt, Karl. *Turtles of the Chicago Area*. Field Museum of Natural History, Chicago, Illinois. 1938. 23 pages.

Smith, Hobart. *Amphibians and Reptiles of Kansas*. University of Kansas Natural History Museum. 1950. 337 pages.

Stebbins, Robert K. *Amphibians and Reptiles of Western North America*. McGraw-Hill Book Company, New York City. 1954. 528 pages.

Zim, Herbert, and Smith, Hobart. *Reptiles and Amphibians*. Golden Nature Guide, Simon Schuster, New York. 1953. 157 pages.

Heavens

(Continued from page 45)

poorly placed for observation.

Venus, low in the southwest at sunset, will be an evening star. It will set one hour after the sun on January 1, one and one-half hours after the sun on January 15, and two hours after the sun on January 31. By the end of this month, it will be very favorably placed for observation.

Mars, southwest of the Pleiades, is fading quickly from magnitude -0.6 on January 1 to $+0.2$ on January 31. Early in January, it will be found up in the eastern sky at sunset, passing overhead about three hours later, and setting about three and one-half hours before sunrise. By the end of January, it will be nearly overhead at dark, setting at about 2:30 a.m.

Jupiter, in Libra, will remain fairly low in the sky. On January 1 it will rise in the east-southeast at about 3:30 a.m. and will be low in the southeast at dawn. By the end of January it will rise at about 2 a.m., and will be in the southern sky by sunrise.

Saturn, in Sagittarius, will not be too well placed for observation during most of January. It will rise two hours before the sun by the end of the month, and will be low in the southeast at sunrise.

The Quadrantid meteor shower is expected on January 3, with a maximum zenith rate of 40 meteors per hour.



The ORPHAN RACCOONS

by Mary Louise Edwards

Illustrated with 50 true life photos. A delightful and amusing account of the problems and pleasures involved when you suddenly become the foster parents of two baby raccoons. It's happy reading for old and young.

\$2.50

BARTON HOUSE, Publishers
Box 345, Ann Arbor, Michigan

YOUR BOOK CAN BE PUBLISHED!

Our high royalty—low subsidy complete program can help you join Comet's list of widely recognized and successful authors. Send for **FREE** copy of *How To Publish Your Book*.
COMET PRESS BOOKS
Dept. NM-1 200 Varick St., N. Y. 14

TREES-SHRUBS

RAISE THEM FROM SEED

\$555 for you in Christmas Trees, ornamentals, timber and others. Seeds normally produce seedlings in a few days or weeks. Transplant from garden or seed bed when conditions of soil and weather most favorable. For Price List and **FREE** Planting Guide. Write to **WOODLOT SEED CO., NORWAY 21, MICH.**

YOU CAN PUBLISH YOUR BOOK Free illustrated brochure tells how we published, promoted and distributed books for over 3,000 authors under our 40%-royalty-subsidy plan. No charge for editorial appraisal of your manuscript. All subjects welcomed. Write Dept. NM-1 EXPOSITION PRESS / 386 4th Ave., N. Y. 16

HACKMATAACK

CAMP FOR BOYS AND GIRLS
INTERESTED IN NATURE STUDY

A wonderful spot for youngsters 7-12 years of age! Here in the beautiful Berkshires our special facilities and expert staff is ready to help those interested in natural history subjects. Geology, botany, birds, conservation, the sky, and all that lives in the earth, the air and water. Swimming, riding, shop, crafts, daily farm activities.

Eight week season only

• Write about your child to •

GEORGE F. DILLMAN
OTIS, MASS.

THE Nature CAMERA

By EDNA HOFFMAN EVANS

The Yearly Resolutions

NEW YEAR'S RESOLUTIONS ARE ALWAYS TIMELY subjects for the month of January. Most of us make at least one resolution, and some of us really intend to do as we have resolved.

Most of my New Year's resolutions usually deal with things I want to do, or to avoid doing, in photography. It is always interesting to see what other photographers have resolved, so I am quoting here a rhymed resolution by Winnie Van Sickle, which appeared in the PSA Color Division *Bulletin*. Here it is:

Dream for the New Year

We Resolve:

To shoot more pleasing pictures
To watch the composition.
To give them more appeal, and
Better color rendition.
We'll try to watch the contrast,
And look for special lighting;
We'll think up new ideas
That keep the Judges biting!
We'll cut out "busy backgrounds,"
(We want our pictures simple!)
We'll shoot the "point of interest,"
(Could be she'll show a dimple!)
We'll screen out even numbers;
And skylines won't bisect.
We'll shoot our slides so neatly
That salons will not reject!
Each one will "tell a story,"
And will interest even YOU;
Exposures will be perfect,
And our color slides will, TOO.
There'll be no double subjects,
Light spots that 'tract the eye;
There'll be no "lack of detail,"
Or dark places to pass by.
We'll have no fuzzy sections,
Or static composition;
Impact will be terrific,
With all on exhibition!

And, believe me, with all those goals to live up to, that really is a dream for the New Year. Can anybody abide by them all? I am inclined to quote the Captain in *H.M.S. Pinafore* and say "never"—or, at least, hardly ever.

Composition is something that needs constant attention. No matter how appealing the subject may be, if it is not composed artistically it fails as a good picture. The same holds true for color rendition (in the case of color photography), contrast, and special lighting. They are all important elements in the production of a good picture.

Wide divergence

Appeal is something else again. While most people can agree on the foregoing three elements, there is a wide divergence of reaction when it comes to appeal. What appeals to one person actually may repel another. Some people like animal pictures, some like babies, some like "moody" shots, while still others go for geometrics or patterns. New

On the other hand, that little New Year's rhyme is well worth more than just a rapid reading. Mrs. Van Sickle really knows her contest terminology. More than that, she knows from actual experience many of the pitfalls and stumbling blocks that lie in the path of amateur hobby photographers. To show this, let us do a bit of analyzing.

Although it shows an even number of mushrooms, this photograph by fifteen-year-old Gail Perry of Lodi, California, illustrates most of the other qualities described in "Dream for the New Year." It has good composition, dramatic contrast, special lighting, a simple background, tells a story, is sharply focused, and has impact. It won Gail a \$200 prize in the 1958 Eastman-sponsored contest for high school-aged photographers. Entries for the 1959 contest will be accepted through March 31. For complete details write to Kodak High School Photo Contest, Rochester 4, New York.





The new Bell & Howell Infallible electric eye still camera uses 127 film for black and white or color shots and 2x2 slides. A matching flash holder for indoor pictures, and a leather candid carrying case are included with this camera.

ideas are related to this matter of appeal, also—something completely new in the way of approach or treatment will win no praise from a conservative, while it may "send" an iconoclast into a state of ecstasy.

"Busy" backgrounds are those that have too many distracting details; they intrude and often even run away with the picture. The main idea cannot compete with its surroundings. Sometimes it is difficult to isolate the main point of interest from its setting. But a good picture by our present artistic standards is a simple one. Therefore, strive for simplicity.

A point of interest is another "must" in good photography. The lack of one makes many an otherwise good picture fall flat. There has to be some important detail in the picture for the eye to focus on. It need not dominate entirely, but it should give meaning and purpose to the scene. It is the lack of a definite point of interest that causes so many landscape shots to falter.

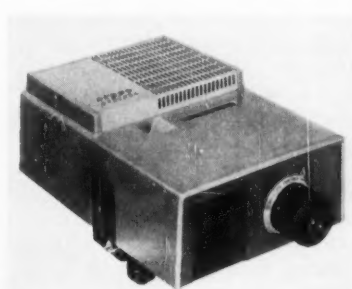
The magic numbers

Now, about even numbers. We inhabitants of the western portion of this world seem to find them less appealing than we do odd numbers. Three, to us, has some sort of "number magic" about it. Remember the three wishes in the fairy tales—the three tasks that the hero had to perform in order to win the princess and half the kingdom, the three magic objects his wizard friend gave him in order to overcome the obstacles in his path? Seven is another number with magic in it. Thirteen, on the other hand, is bad luck, for a variety of reasons.

The odd number preference holds true in our artistic tastes, too. We do not like our pictures to be divided equally, half and half. Nor do we like evenness in our odd-numbered divisions. For example, a picture that is one-third sky, one-third water, and one-third beach is not appealing in proportions. We want balance, but we usually prefer it to be asymmetrical. Thus, the bisecting skylines in the jingle are definitely among the things we should avoid in our pictures.

Nor do we want "double subjects." A picture should have only one point of interest. It should have one aim; it should tell one story. Some "busy" pictures have several subjects. Some are so busy that it is difficult to tell just what is in them.

Light spots are distracting, either



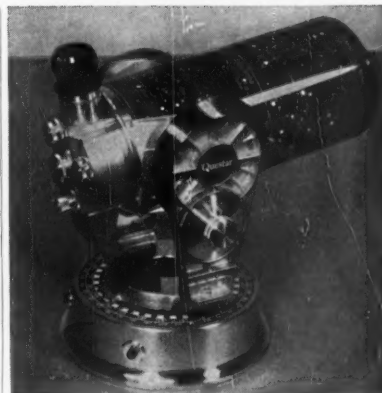
This is the new Argus Special color-slide projector.

in color or in black-and-white. They tend to attract the eye away from more important areas, just because they are so bright and eye-catching. They may be white spots, or small areas light or bright in color. Sometimes they are called "hot spots"—and no matter what they are called, they do detract from the overall quality of a picture.

At the other end of the scale, large areas of darkness—be they solid blacks or areas so dark that no detail shows in them—are also to be avoided. Solid shadows can tell a story, but they must be skilfully placed, otherwise they simply "black out" a needed area.

Out-of-focus objects

Fuzzy sections result from several causes. Lack of adequate depth of field is a major cause. Objects too close to the camera are out of focus while things farther away are sharp. No matter how good ninety-eight percent of the picture is, somebody is bound to find a two percent area of fuzziness distracting. Sometimes,



WORLDS FINEST, MOST VERSATILE TELESCOPE

A true research instrument of surpassing quality, internationally used by a distinguished scientific and amateur clientele as a portable observatory, long-distance microscope or mighty telephoto lens. Superb for terrestrial viewing, with unequalled power and sharpness. The first breakthrough in optical science in 200 years makes this telescope possible.

Entirely handmade. Ultra-precise optics in 8-inch barrel, weight 7 pounds. Marvelously compact, elegant, luxuriously complete. Sold only direct, \$995, in imported English leather carrying case.

Literature on request

QUESTAR CORPORATION
Box 90, New Hope, Pennsylvania

AUTHORS WANTED BY N. Y. PUBLISHER

New York, N. Y. — One of the nation's largest book publishers is seeking book-length manuscripts of all types — fiction, non-fiction, poetry. Special attention to new writers. For more information, send for booklet 62 — it's free. Vantage Press, 120 W. 31 St., New York 1.

**PEOPLE OVER 35 DISCOVER
QUEEN BEE FOOD SUPPLEMENT**

with 50 milligrams of ROYAL JELLY and essential Natural Vitamins and Minerals in SUPER-POTENCY gives wonderful feeling of YOUTH and WELL-BEING — the answer to longer life. 30 days' supply, \$5.00.

**FLORIDA NATURAL FOODS, Dept. 21
Box 3694, MIAMI 23, FLORIDA.**

ARTHRITIS—RHEUMATISM VITAL FACTS EXPLAINED

FREE DESCRIPTIVE BOOK

As a public service to all readers of this magazine, a new 36-page highly illustrated book on Arthritis and Rheumatism will be mailed ABSOLUTELY FREE to all who write for it.

This FREE BOOK fully explains the causes, ill-effects and danger in neglect of these painful and crippling conditions. It also describes a successfully proven drugless method of treatment which has been applied in many thousands of cases.

This book is yours WITHOUT COST or obligation. It may be the means of saving years of untold misery. Don't delay. Send for your FREE BOOK today. Address The Ball Clinic, Dept. 543, Excelsior Springs, Mo.

in Nature pictures taken outdoors, a blade of grass or a twig will get between the lens and the subject and cause a fuzzy patch. Sometimes a faint breeze at the wrong moment causes motion and results in fuzziness. Sometimes an animal or a bird will move unexpectedly. Sometimes a suggestion of movement will add life to a picture. But for every time that happens, there are dozens of others where the picture is ruined. I belong to the sharp focus school of thought. "Soft focus" to me is a mark of poor photography. There are those who disagree, of course.

"Impact" is that indefinable something in a picture that "hits you between the eyes" the minute you see it, and makes you look again. Usually you like what you see; you want to study it, to enjoy it, and you remember it for a long time afterward.

"Static" composition means lifelessness, lack of imagination, the same-old-thing sort of picture that never even gets started and as a result "never gets anywhere." It is rather hard to define because most of its characteristics are negative. It must be seen or "felt" rather than described.

And so the dream is really not so impossible, after all—except for the very last line. While I have seen judges agree on one unmistakably excellent picture, I also have seen them disagree quite widely on many that are of a really high quality. Get *all* the prints or slides you enter on exhibition, at least if every one you enter is so excellent that there can be no doubt about it. But as long as judges are human and individual, I am inclined to be dubious as to your chances.



"Control"

(Continued from page 40)

was not discharged. Maybe they figured he was less dangerous on the inside than on the outside.

Illustrative of this "integral family" backscratching at the expense of wildlife is an editorial in the California Department of Fish and Game's publication *Outdoor California*, July, 1958. Speaking of the great destruction to wildlife in the 1958 poison fiasco engineered by the California Department of Agriculture and the U. S. Fish and Wildlife Service, the editorial reads that "the important thing about the crisis of last March" is that the Fish

and Game Department quickly isolated the cause of the trouble and recommended prompt action which "thus headed off what might have become a major public reaction."

Do not get the idea that "corrective action" meant a permanent stop to the poisoning programs. After considerable piety, the editorial ends not by a solemn assurance that it will use its influence against dangerous poison projects, but by telling hunters, "How You Can Help: Just report any suspected cases of poisoning to the Fish and Game Department or to the nearest agricultural agency." In other words, report it to an agency interested in "heading off a major public reaction."

Ironic! Wayland Potter, mountain lion hunter, and other alarmed persons can tell you that, if reports are answered at all, an official whose financial interests parallel the poison programs will take a look at the carcass, kick it over, and opine "something else must have killed it."

In the *Arizona Sportsman*, May, 1958, Potter writes: "With the Fish and Wildlife Service's expensive laboratory equipment and biologists counting the pin feathers on doves, checking the reproductive organs of deer, here eight javelinas [peccaries], our leading game animal, turn up their heels and die near a 1080-bait station and nothing more was done than a hasty check by a decidedly biased official of the Service. . . This is only one of many cases where the poison program has backfired and the officials have suppressed the facts to shield the poison programs from public criticism at any and all costs."

A typical case showing official incompetence coupled with official agility in concealment is this: On the opening day of the 1955 deer season in central California, hunters reported to the game warden an alarming number of sick and dead deer in areas where 1080-poisoned grain was found in abundance on top of the ground. That was on August 6. Not until August 15 did the Fish and Game Disease Laboratory begin a survey which admitted finding 135 dead deer.

Before the Department got its wheels in motion, a Los Baños veterinarian had performed an autopsy on two dead deer and found oat grains in one stomach. He fatally poisoned a dog with the juices from portions of the deer's viscera.

The Fish and Game Department squirmed out of that one by reporting, "None of these specimens were retained, so confirmation by the State was not possible."

The veterinarian also sent the stomach contents of a fawn to the Twining Laboratories in Fresno. Results showed that: "The presence of fluorine in the stomach is significant and may have caused the death in the form of sodium fluoroacetate" (Compound 1080). One penned deer was starved to the point of eating Mexican milkweed, its death from this being similar to fatal cases of 1080 poison. Ergo, milkweed was blamed.

Then, out of the report came the yes-no-maybe-so final revelation: "It is possible that some animals may have died as a result of consuming 1080 poisoned grain, and some have died as a result of having consumed a lethal dose of Mexican milkweed." And in the local press (Fresno), where earlier reports attributed deaths to 1080-poisoned grain, were put headlines: *Milkweed Is Believed Cause of Mysterious Deer Deaths on West Side*.

So public indignation died down—which is exactly what officials count on. Poisoning continued unabated. Then came the poison outrages of 1957 and 1958, already mentioned. Again the cover-up with official protestations of piety. And again, business as usual.

The poisoning still continues. How much? When you write these various Federal and State officials for figures you get ambiguous, ever-varying, and indeed conflicting "information." The first six months of 1958 in California, using the smallest non-conflicting figure of just one department alone, saw at least 96,840 pounds of 1080-poisoned bait visited on us—and so on you. Similarly, the poisons destroying wildlife in your State, in official quietude, are visited on us.

Every American has a stake in the Nation's remaining wildlife—whether it is in California, or Michigan, or Maine—and a responsibility to see that it is saved for future generations without further inroads by the serene bunglers.



Bulletin

"The Old Farmer's Almanac" for 1959, in its 167th edition, is now available from *Yankee, Inc.*, of Dublin, New Hampshire, for 35 cents.

Nature IN ROCK AND MINERAL

By PAUL MASON TILDEN

Of Nuggets and Notions A NATIVE OF NEW MEXICO ONCE TOLD ME that the mining camp of Silver City, in the southwestern part of that State, produced in bygone days a mass of silver so large that it had to be cut into two pieces to get it into a freight car for shipment and exhibition at the 1892 World's Fair in Chicago. Perhaps the dimensions of that nugget may have increased a bit with the passing years, but, nevertheless, some of the native metals that are not subject, or are only slightly subject, to chemical attack after they have weathered from their lodes are sometimes found in proportions truly heroic.

Native gold, as found in placer operations, may range from one extremity of the scale to the other—although of course the man with the gold pan is always happy to see his "colors" lean toward the coarser end of the measuring-stick. This native metal may range in size from particles that are weighed in millionths of an ounce to famous lumps like the "Welcome Stranger" nugget of Ballarat, Australia, that tipped the scales at 2280 ounces, and whose

worth—in metal—would currently be about \$80,000.

There is, incidentally, an interesting and widely held belief among some of the "old hands" at gold panning that nuggets of this metal in placer gravels are capable of growing in size, and they point out that the larger nuggets in the gravel seem to average bigger than those found "in place" in the parent lodes. This notion is not supported by most professional mineralogists, because it has been established that placer gold has the same internal crystalline structure as its lode counterpart. Yet the mineralogist is still somewhat at a loss to account scientifically for the seeming disparity of sizes.

Whether or not the famous "silver sidewalk" of the La Rose mine at Cobalt, Ontario, might be called a nugget is debatable. At any rate, it is a fact that a hundred feet of this mine was paved with almost solid silver, and a five-foot ore specimen from the La Rose contained nearly ten thousand ounces of the metal!

Copper, too, has been recovered in enormous masses. In one of the

(Continued on page 53)

A huge nugget of copper, found fifty-three years ago north of Whitehorse in the Yukon Territory, was brought down the frozen White River to the Alaskan Highway and thence to Whitehorse, where it is now on display at the McBride Museum of the Yukon Historical Society.

PHOTOGRAPH BY DON MATHESON, COURTESY OF THE ALASKA SPORTSMAN



SHOPPING for PRICE?

Immediate Delivery — Prepaid
CHAIN Gold or Rhodium Plate. 10 feet for \$1.00
Fine Link. 6 for \$1.20
NECKLACES 15" of above chain. 12 for \$2.30
Complete.
(add 10c per necklace for 18" chain)
EARWIRES Pierced. Gold Fill. 6 pair for 60c
12 pair for \$1.00
EARWIRES Pierced. Sterling. 6 pair for 70c
12 pair for \$1.20
Silver.
Add 10% Fed. Tax. Calif. Residents also add 4% Sales Tax.
FREE CATALOG showing easy to use and inexpensive JEWELRY PARTS.

JEWELGEMS by JAY O' DAY

P. O. Box 6N Rancho Mirage, California

GENUINE RUBY CRYSTALS

India, perfect, good color, 1/2 inch each. @ \$1.00 ea.

GENUINE FACETED SMOKY QUARTZ TOPAZ

15 m/m heart shapes. Special Price \$2.00 ea. or 2 for \$3.50

FACETED BLUE SAPPHIRES, Ceylon approx. 1/4 ct. and up, first grade, round brilliant. @ \$7.00 ea.

ORANGE TOPAZ—FINEST COLOR faceted 7 m/m round. @ \$1.00 ea.

Add 10% Federal Tax
INQUIRE FOR FINE FACETED STONES, COMMERCIAL AND RARE. ALSO FINE ROUGH. WILL SEND APPROVALS.

R. C. ROMANELLA

IMPORTERS OF COMMERCIAL MINERALS
22 West 48th Street New York 36, N. Y.

COMPREHENSIVE CATALOGUE

Of Minerals and Associated Geological supplies. \$1.00. Refunded with over \$10.00 purchase. Most complete stock of domestic and foreign minerals. Shells and butterfly collections. We have everything imaginable.

Eckert Mineral Research, Inc.

110 E. Main St. Dept. N. A. Florence, Colo.

GEMS & MINERALS

The Leading GEM & MINERAL HOBBY Magazine is the largest and most complete gem, rock, and mineral hobby magazine, gives you more "how-to" articles, mapped field trips, pictures, features, and ads. The only monthly in the rock hobby field. \$3.00 per year. Subscribe Today! Rocks are Fun. Sample 25c. GEMS & MINERALS, Box 687ND, Mantone, Calif.

ROCKS, MINERALS, AND FOSSILS

BECOME A SELFMADE MINERALOGIST by using our correctly classified and analyzed rocks and mineral kits. A new and colorful, visual aid for your Science class. A must in every school. Mail \$1.00 to White Mountain Mineral Shop, Campton, N. H.

2 KEY RING. 2 pair ear rings. 2 western ties, 2 necklaces, 2 shirt corners and 10 polished specimens all for \$7.50 postpaid. Morton Minerals & Mining, 21423 Highway 66, R.F.D. 1, Barstow, Calif.

THUNDER EGGS, polish halves \$1.25 postpaid. Baroque Gem Stones, 10 for \$1.10 postpaid. Gemstone Kits, six different kits \$3.60 postpaid. Roy's Rock Shop, Box 133, Trinidad, Calif.

MINERAL SPECIMENS all varieties from world wide localities. Choice quality, lowest prices. List free. Plummer's, 47200 Point Loma Ave., San Diego 7, Calif.

GEM MATERIAL from the Mojave Desert. Jasper, palmwood and agate. Shipped mixed, 100 lbs., \$10.50 F.O.B. Barstow. Morton Minerals and Mining, 21423 Highway 66, R.F.D. No. 1, Barstow, Calif.

SPERM WHALE TEETH send 25c for sample slice. Scrimshaw, 602 Rust Ave., Big Rapids, Michigan.

PRECIOUS VIRGIN'S VEIL WHITE JADE, Black Garnet, Agatized Cedar, Gem Obsidian, Barite Rosettes, Seven other rare specimens, \$2.00. Old Prospector, Canyon, California.

QUALITY MINERALS AND FOSSILS for the beginner, advanced collector, School or Club. Send 5c for list. State main interest. Anthony Thurston, Morningdale, Mass.

THE Nature MARKET

AUTHOR'S SERVICES

NO-LUCK finding a book publisher? Learn about our successful program. Free Booklet—NT—Vantage Press, 120 W. 31st, New York City.

LOW COST publishing service: author ownership, 70% royalties. Send for free folder. William-Frederick Press, 391 East 149th, N.Y.C. 55.

BABY EVERGREENS

BABY EVERGREENS, SEEDS, Seedlings, ornamentals and Xmas tree stock. Azaleas, Rhododendrons, Flowering shrubs, Blueberries. Catalog free. Girard Bros. Nursery, Geneva, Ohio.

BINOCULARS

BINOCULARS. Microscopes, importers' prices. Folder, "Binocular Selecting", catalog free. Prentiss Importers, Mercury Bldg., West Los Angeles 25, Calif.

BIOLOGICAL SUPPLIES

NATURALIST'S CATALOG 25c. Pairs: Hamsters \$2.75. Flying Squirrels \$12.50. 1000 Mealworms \$3.40. Chameleons, turtles, salamanders, frogs, all 85c each. Quivira Specialties, Topeka 20, Kansas.

BOOKS

BACK ISSUES of Nature and other natural history magazines bought and sold. Robert Rhodes, 411 Davidson Street, Indianapolis, Indiana.

BOOKS ON BIRDS, Mammals, Reptiles, Trees, general nature subjects. Catalog sent on request. Pierce's, Winthrop, Iowa.

BOOKS. Hard-to-find and out-of-print our specialty. All subjects. Send Wants. Jaher Book Service, 183 Hazlewood Drive, Westbury, New York.

ALL NATURE BOOKS (and others) in print conveniently available from GRITZNER'S MAILBOX BOOKSHOP, Mesa 1, Arizona. Catalogue 10c.

WORLDWIDE-SEARCH-SERVICE, out-of-print books located free. Literary Mart, 1265 Broadway, New York.

BUTTERFLIES

BUTTERFLIES: 20 Named United States including Giant Moths, Zebra, \$2.00. 20 Different Amazon including Swallowtails, Gorgeous Urania, \$2.00. 20 World Tropicals including Emerald Swallowtail, Huge Bird-Wing, \$2.00. M. Spelman, 2277 Andrews Ave., New York 68, N. Y.

FINEST and most **COMPLETE KIT.** Contains 15 tropical butterflies, 4x12 spreading board, 60 glass headed pins, 100 insect pins, 1 chemically treated relaxing jar for softening butterflies, 2 glass strips, paper strips, 1 glass top Riker display mount, 1 pair broad point forceps triangular collecting envelopes, a 16 page picture booklet with step by step instructions for mounting, dispatching, preserving butterfly collections plus other interesting information with nylon butterfly net for \$4.95 postpaid. Nylon net \$1.95 postpaid with instruction book. Free price list upon request, many butterfly bargains. America's largest dealer. Butterfly Art Jewelry, Inc., 291 East 98th St., Brooklyn 12, N. Y., Dept. N4.

COLOR SLIDES

ALASKA and its WILDLIFE. 400 finest quality color slides of big game, sceneries, cities and Eskimos. Send 25c in coin for sample slide; free catalog. Northern Color Film Co., Box 30, Cooper Landing, Alaska.

CHEMISTRY

MICROSCOPE SLIDES, anatomical. Expertly prepared for teaching and study. Work prepared to order. Write for free list. Bay Histology Laboratory, 409 Roosevelt, San Francisco 14, Calif.

EDUCATIONAL-SCIENTIFIC

LEARN WHILE ASLEEP equipment for experimenters. Full line timers, pillow speakers, endless tapes. Also books, languages, self-help personality improvement courses on record. Inquiries invited. Sleep-Learning Research Association, Box 24-NM, Olympia, Washington.

HOBBIES

SEASHELLS, Nature's Treasures of the Sea, appeal to Hobbyists. Lists of \$1.00 to \$5.00 Specials on request; 5 Odd Marine specimens \$1.00; write for free lists today. Mrs. F. K. Hadley, 48 Adella Ave., West Newton, Mass.

HOBBIES

"GEMS & MINERALS Magazine" largest rock hobby monthly. Field trips, "how" articles, pictures, ads. \$3.00 year. Sample 25c. Box 687NC, Mentone, California.

HOME STUDY

PAINT OILS: Exciting Home-Courses. Trial Lesson FREE, specify landscape, Still-Life, Portrait or Marine. Prickett-Montague Woodwind Studio, Monterey, Massachusetts.

INDIAN CURIOS—RELICS

SCALPING KNIFE, flint Thunderbird, 2 fine Indian war arrowheads \$4.00. Catalog free. Arrowhead, Glenwood, Arkansas.

BIG 1959 Catalog Indian Books-Relics 50c. Fifteen Arrowheads plus Spearhead \$5.00. Tilton Indian Relics, Topeka 20, Kansas.

NORTH AMERICAN INDIAN Relics, mound builder, pre-Aztec figurines, stone axes, ceremonial, spears, arrowheads, pipes, tools, etc., List. Antiquities, 7500 S. W. 16th St., Miami, Florida.

LEATHERCRAFT

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791—V28, Fort Worth, Texas.

MISCELLANEOUS

INDIAN RIVER CITRUS Fruit organically mineralized, sun ripened, unpoisoned, mixed sizes. Oranges, grapefruit or mixed. \$4.50 bushel plus express. Raw Honey \$1.95, 4½ lbs. with fruit if shipped separate add postage. Herschell Groves, Rt. 4, Box 390, St. Pearce, Florida.

FREE NATURE CATALOG NUMBER 7. Covers, books, games, records, charts, collecting equipment, plastic mounts, etc., a wealth of aids for out-door adventure. Send for our spectacular new game of NAUTILUS, a game of sea-shells in full color on 56 cards only \$1.35. Naturegraph Co., San Martin, California.

TREE RIPENED ORANGES or Grapefruit or mixed. Organically grown. Not gassed, washed or sprayed, \$4.50 bushel FOB. \$1.95 for 4½ lb. Florida Honey. Postage extra if mailed. Also Dried Fruits & Nuts. Organic Acres, Box 37, Seffner, Florida.

HOW TO STAY HEALTHY by Postman forty-two years, no sick days. Booklet, fifty cents. Excellent for young folks. W. A. Lowry, 909 S. Grand, Gainesville, Texas.

RAISE GUPPIES for fun and profit. 2½ gallon aquarium, 10 guppies, 20 snails, 10 plants, \$12.00 plus postage. Send \$12.00 to: Guppies, 142 Illinois Avenue, Oak Ridge, Tennessee.

PLASTICS

PLASTIC BOXES, CLEAR. Ideal for Display. Handling and Storage of small items. Free List. Althor, 170 Bay 23 St., Brooklyn, N. Y.

STAMP COLLECTING

FREE 103 BRITISH COLONY Stamps. Approvals. Enclose 10c for handling. Niagara Stamp, St. Catharines 601, Ontario, Canada.

ECUADOR STAMPS picturing TROPIC BIRDS in brilliant colors. Unused set 6 complete, 15c to Approval Applicants. Edwin Morr, 1204 Sandusky, Ashland, Ohio.

STAMP ZOO including Kookabura, Zabu, Kangaroo, Koalabear, Rhinoceros 10c. Approvals. Lincoln Stamp, St. Catharines 602, Ont., Canada.

TAXIDERMY

TAXIDERMY LESSONS quarter each. Birds, Mammals, Game heads, Fish Tanning. Devereaux Taxidermy School, 724 N. Verlinden Lansing 15, Michigan.

WILDERNESS TRAIL TRIPS

Wilderness Trail Trips—hiking and riding. Yearly calendar of activities, including trips in California Sierra Nevada, Arizona and Mexico. Family groups and inexperienced people come. Outstanding for natural science interests, photography and rock collectors. Wampler Trail Trips, Box 45, Berkeley, Calif.

Classified advertising rate — 25 cents a word each insertion, minimum \$5.00, cash with order. Abbreviations, initials, and numbers count as words. Discount: 3 times, 5%; 6 times, 10%; 10 times, 15%. March issue closes January 20. Mailing date, February 20.

Tells How You Can Learn to

FUN! RECREATION! PROFIT!

FREE BOOK

MOUNT BIRDS!

Learn At Home

Men, Boys, Hunters, Fishermen, mount and save your lovely wild-game trophies. Be a Taxidermist. Mount Birds, Animals, Heads, Fish, Tan skins. YOU learn easily, quickly in spare time. Have a grand home-museum. The finest and the greatest hobby known, for sportmen, fun, real profits.

Yes, **FREE** Beautiful strange, valuable Book, telling all about Taxidermy. Contains over 100 beautiful game-pictures. And it's yours **FREE**, if you rush your request. You can mount all kinds of wild-game, and common specimens too. We can positively **TEACH YOU**. So **GRASP** this opportunity. **RUSH** letter or postal for this amazing **FREE BOOK**. Don't delay. **State your AGE**. **N. W. SCHOOL OF TAXIDERM, 8101 Elwood Bldg., Omaha 2, Neb.**

RESEARCH

— beyond polio

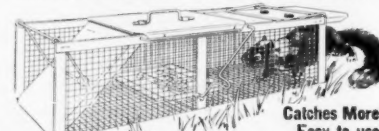


... ARTHRITIS, BIRTH DEFECTS, VIRUS DISEASES

JOIN THE MARCH OF DIMES

==== TOWARD GREATER VICTORIES ====

CATCH THEM ALIVE AND UNHURT!



Catches More!
Easy to use!

Amazing **HAVAHART** trap captures raiding rats, rabbits, squirrels, skunks, weasels, etc. Takes mink, coons without injury. Straying pets, poultry released unhurt. Open ends give animal confidence. Fully guaranteed. No jaws or springs to break. Rustproof. Sizes for all needs. Send for booklet on trapping secrets illustrated by Carl Burger. **HAVAHART, 144-J Water Street, Ossining, N.Y.** Please send me **FREE** new 40-page booklet and price list.

Name _____
Address _____

Rocks and Minerals

(Continued from page 51)

copper veins of the Keweenaw Peninsula in Upper Michigan there was found a mass of copper that weighed some 500 tons. Would such a mass of metal qualify as a nugget? Actually, there seems to be no arbitrary upper limit to the word, although the *smallest* nugget is usually thought of as about the size of a pea or bean.

An interesting story comes out of the Far North concerning a big copper nugget that took fifty-three years to make its way into a museum.

In the year 1905 and in a place 250 miles north of Whitehorse in the Yukon Territory, a miner uncovered a great copper nugget that he felt was worthy of preservation as a specimen. It was suggested that the nugget be sent to the Alaska-Yukon Exposition as a show-piece; but the miner demurred. He was afraid that his prize might be lost in transit.

Last year—the sixtieth anniversary of both the Yukon Territory as a separate political subdivision, and the Klondike gold rush—the copper nugget finally made its appearance in civilization. The big piece was brought by tractor down the frozen White River to the Alaskan Highway and trucked to Whitehorse, where it is now on display at the Yukon Historical Society's McBride Museum. According to Mr. W. D. McBride, president of the Yukon Historical Society, the nugget has been found to weigh 2590 pounds—a showpiece for any collection! ♪ ♪

Outpost

(Continued from page 16)

martyrs to science, determined to freeze or perish in the attempt!" remarked a news story. "... So idiotic—so like a lunatic—perfectly chimerical!" said another. But there seemed to be little resentment among the group at the top of the mountain. Indeed, it is obvious that the men enjoyed these shafts of wit from the lowlands; they requested that some of the rough humor be included in a printed account of the expedition.

On May 12, 1871, the last telegram was sent to the outer world. The memorable winter expedition—the world's first high-altitude weather research attempt—had officially come to its conclusion, and with their hard-won recordings and observations the men returned to the more routine life of the lower country. Along with their charts, notes,

photographs and drawings, they "carried with them a sense of regret" as they took leave of the rugged mountain "whose cloud-enveloped summit has so long been home."

As to the question of predicting the weather for hours and days beforehand, the party maintained a discreet silence. Perhaps some future day will provide a truly infallible answer to that! ♪ ♪ ♪

RARE ARROWHEADS

14-AFRICAN PIGMY \$2 ppd.
12-AMERICAN INDIAN \$2 ppd.

Thrill youngsters with these sets of clean museum-quality specimens. Supplies are limited. Order your sets today. We ship within 24 hours.

CALVIN HOUSSE P. O. BOX 514
WESTWOOD, NEW JERSEY

WANTED: MANUSCRIPTS TO PUBLISH

Best Book Contest

\$1600 cash
awards

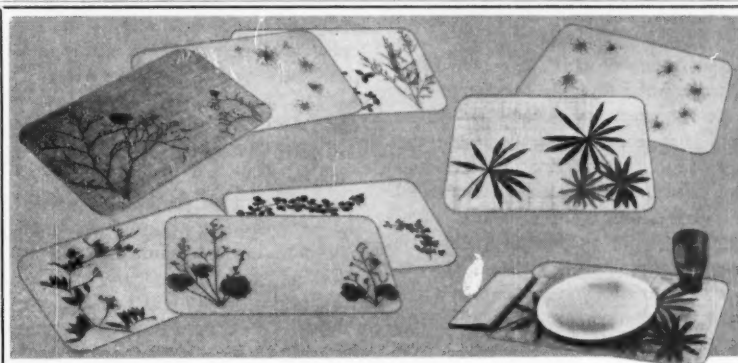
write for rules

We will publish, promote, advertise, and distribute your book. We are among the leading, largest publishers in the U. S. Our successful plan insures prompt publication and 40% royalty. Send Manuscript. We will report in one week. No obligation.

Send for free Brochure NN

PAGEANT PRESS, INC.

101 Fifth Ave., N. Y. 3



Dorothy Thorne creates nature table accessories ... AND SHOWS YOU HOW TO DO IT

This talented Midwestern craftsman has applied her skill to a new medium. Native flowers and leaves from the Illinois prairies, all hers for the picking, were used to produce the happy results as shown in the photographs.



The laminating process itself is so truly simple that practically anyone can do it. Neither heat nor pressure are required, nor is any equipment needed except a pair of scissors and a set of measuring spoons.

Dorothy Thorne used maple, honey locust and lupine leaves in the placemats shown above. Also wild sweet peas, coral bells, statice, Queen Ann's lace and a variety of grasses and clovers. Incorporating theatrical gauze, bamboo mat and burlap in the laminates lends further interest to the various arrangements. You could make dozens of pieces and never repeat a design.



If you find this craft interesting, write to us for the illustrated, step-by-step directions that Dorothy Thorne has carefully explained in a special issue of THE CASTOLITER. Please enclose 25c to cover mailing and handlings costs. Address your letter to Dept. A-90, The Castolite Company, Woodstock, Illinois.

THE CASTOLITE COMPANY
Woodstock, Illinois



Here is another one of Nancy Hutching's enchanting screen designs. These were featured in the October issue of NATURE MAGAZINE. Detailed directions are available for 25c per copy.



Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

African Sleeping Sickness

3. The Vectors

AFRICAN sleeping sickness of man—and nagana, surra, and other fatal diseases of his domestic animals—are fly-borne infestations that render large sections of Africa unfit for human habitation. In previous installments of this series we have described the disease and the pathogens—those organisms that cause it. They are various species of the protozoan genus *Trypanosoma*, and the affliction is accordingly termed *trypanosomiasis* by the medical fraternity. This chapter will describe the flies that carry the parasites from one host to another, a role that earns them the designation of *vector* by the parasitologist.

In Africa the vectors are always members of the genus *Glossina*, known as tsetse flies. *Glossina* is from the Greek meaning tongue (*glossa*) in reference to the proboscis of these flies, a conspicuous characteristic; *tsetse* is a Cape Dutch corruption of the Sesuto (the language of the Basutos) *ntsintsi*, fly. It is divided tset-se, with both of the e's short and accent on the first syllable.

Among fly families one of the best known is the Muscidae, named from the type genus *Musca*, which includes the ubiquitous house fly, *Musca domestica*. Our deadly vector of the African scene is revealed as a relative of this common household pest whose distribution is world-wide. Other specialists in this order of insects prefer to rank the general group as the superfamily Muscoidea, and place *Musca* in the family Muscidae and *Glossina* in the family Glossinidae. Fortunately for mankind in other areas, *Glossina* is restricted to Africa, save for an occurrence in Arabia.

The fly itself

Tsetse flies average a bit larger than the housefly and are generally of a golden brown coloration. The proboscis is held straight out in front and the wings overlap, like

the blades of a closed scissors, and are carried straight to the rear, covering the abdomen when at rest and extending well beyond the body. Among technical features, the size ranges from 5 to 10 mm. in length, the body is mostly bare of hairy adornment, a sparse covering of bristles appearing here and there, with a tuft of facial hairs. The antennae are aristate, three-segmented, hairs only on the upper surface of the third segment, secondarily branched. The fourth longitudinal vein of the wing is connected to the third by a cross vein near the wing base, and the cell beyond is shaped like a cleaver, a peculiar character diagnostic of the genus.

The mouthparts—organs suitable as a design for the walls of a necropolis—play a conspicuous role in our story. Two large labial palpi ("feelers") extend forward from the head. They have grooves on their inner surfaces to contain the proboscis. Upon preparing to take a blood meal, the fly lowers the proboscis, the palpi continuing to project forward. The proboscis has a needle-like, piercing labium, bulbous at the base, and armed with rasping teeth at the tip; a labrum-epipharynx as a food tube; and a hypopharynx as a duct of the salivary glands. The microscopist can obtain a close approximation of this apparatus by mounting the mouthparts of *Stomoxys*, the biting stable fly, cosmopolitan in distribution. The two kinds of flies are relatives.

It is in the life history, however, that tsetse flies exhibit a notable peculiarity. House flies lay eggs, but tsetse flies do not. They produce one egg at a time from one ovary, and this passes down the oviduct to an enlarged portion called the uterus, from analogy with that structure in mammals. Here the egg develops through most of the larval period. The maggot is elongate-oval, headless and footless as is usual in the Diptera, and that part within the female is white. Protruding toward the opening of the oviduct are two knobs, darkly pigmented, that con-



The female tsetse fly, *Glossina palpalis*, 5.5X.

tain spiracles, the larva breathing through the mother's external genital orifice. Located near the anterior end of the uterus of the female is a nipple, the opening of the so-called "milk" gland, and to this the mouthparts of the larva become attached, an arrangement curiously like a combination of a placental mammal (uterine development) and a marsupial.

Three larval stages

One egg is produced from one of the pair of ovaries every ten to twelve days throughout the life of the mother. There are three larval instars (stages), lasting for this same duration, and then the mature larva is shed ("born"). It burrows immediately, or crawls a short distance to find a suitable place in which to go under ground. The female must choose a proper site, where the soil is acceptable for this act, termed *larviposition*. Preferred situations embrace a loose soil, not far removed from water, and a shady location. The larva then pupates immediately and spends three to four weeks in this stage. The pupa, as is true of other flies in this group, is termed a *puparium*, the last larval skin serving as a pupal case. It is dark brown, oval, and has the conspicuous anal knobs with spiracles that characterized the larva. From this encasement the adult fly then emerges, employing a structure common to many other members of the Diptera, the *prilinum*, a retractile bladder developed on the front of the head to rupture the pupal case.

As soon as one larva is deposited, another begins its uterine career and, if the temperature is favorable (75-85° F.) one larva is produced every

10-12 days. Adults live for only a few weeks, but the females bear offspring during that period, 3-18 weeks.

Adults of both sexes are voracious blood feeders, but will also take plant juices. They can fly for considerable distances. All of these factors contribute to the difficulty of their control. It is not possible to get at the larvae to exterminate them, as may be done for so many insect pests; it is not easy to restrict the range of adults; it is not possible to concentrate on seasonal efforts of extermination. They are day feeders and are not attracted to lights—and consequently traps—at night.

Essig (1942) recognizes 21 species, with 2 subspecies and 7-8 varieties. They are divided into the *fusca* group, typified by *Glossina fusca*, with 10 species and 2 varieties; *palpalis* group, 5 species, 2 subspecies, 3-4 varieties; and *morsitans* group, with 6 species and 2 varieties.

Of these tsetse flies, some seven are of medical importance in the

terologist to distinguish them with confidence.

The important three

The three of major importance from this list are *palpalis*, *tachinoides*, and *morsitans*, and it is upon these that major efforts at control have been directed. The three differ considerably in their habits. *Glossina palpalis* feeds upon reptiles—chiefly crocodiles—"game" mammals, and man. It pupates close to water in shaded, dry places, and the adult is generally found near water, as along rivers or at watering places (a riverine species). It flies 5-6 feet above ground and generally bites man above the belt. *G. tachinoides*, also a riverine species, likes to pupate in dry, sandy soil near water and prefers game mammals to man for its blood meals. It flies close to the ground and usually bites below the knees. It will not frequent dense underbrush. *G. morsitans* feeds on both game mammals and man and frequents open country, pupating in dry earth.

Study live insects and whole specimens!



MODEL "A"

with TESTA WIDE FIELD MICROSCOPE

Rugged, full-size American-made microscope features large working distance and 15x, 45x, and 75x magnification. Unusual versatility. Arm can be inclined in any direction of a 360° circle. Tube removable for field trips.

Kellner-type eyepiece. Triple divisible objective. Dual control coarse and fine focusing. Large reversible black and white stage. **\$54⁹⁵**

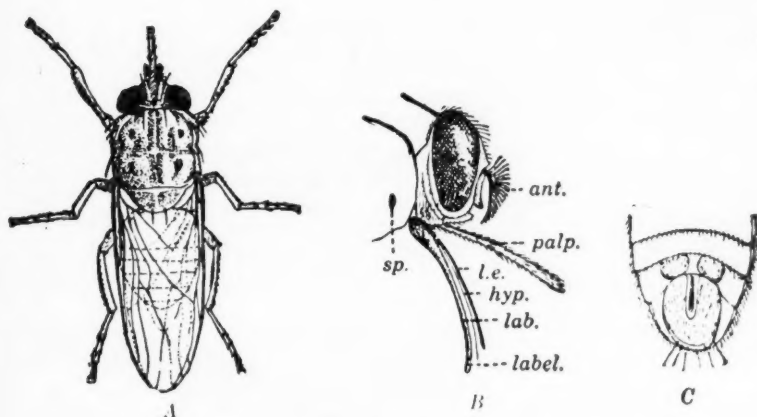
Write for full details!

TESTA MANUFACTURING CO.
Dept. N-1 • 10122 East Rush Street, El Monte, Calif.

G. morsitans thus cover enormous areas of the Dark Continent.

Elimination of these scourges constitutes one of the major problems of present-day Africa. No satisfactory repellents have yet been discovered and efforts thus far have been directed toward attacks upon the sites selected by these flies for pupation, killing the adult insects or, giving up on the problem, the mass removal of whole human populations, together with their domestic animals. Most tsetse species occur in definite "fly belts" of territory along water courses. Clearing these areas and the vicinity of villages has been done, although maintaining such clearings is difficult and expensive; burning grasslands, eradication of reservoir mammals, trapping adults and breeding areas, concentrating game mammals within fenced preserves, wearing of white clothing—since the flies tend to attack dark bodies, as of game mammals and negroes—the wearing of netting, screening houses, fumigating personnel and vehicles—all of these and other measures have been tried. Sometimes they backfire, as instanced by the method of doing away with the natural hosts, as antelopes. Then the flies, deprived of their usual victims, concentrated their attacks on man. The problem is by no means near a solution.

Chandler recounts an instance of just four flies infecting thirty out of forty-three people around a small



A, tsetse fly in resting position, 4X (adapted from Austen). B, head and mouthparts of tsetse fly; labels, top to bottom, antenna, labial palpus, labrum-epipharynx, hypopharynx, labium, labellum; sp., spiracle. After Alcock, *Entomology for Medical Officers*. C, hypopygium of male fly, useful in species identification. (after Alcock). Reproduced by permission from Chandler, *Introduction to Parasitology*, John Wiley and Sons, Inc., New York.

transmission of trypanosomiasis. *Glossina palpalis* and *G. tachinoides* are the principal vectors of Gambian sleeping sickness, with *G. pallidipes*, *G. brevipalpis*, and *G. fusca* as minor agents. *Glossina morsitans* is the main culprit in Rhodesian sleeping sickness, with lesser contributions from *G. swynnertoni* and *G. brevipalpis*, while nagana is passed from mammal to mammal by *G. morsitans*. While these flies differ in size and markings, it takes an expert dip-

The range of these three species, as given by Craig and Faust, is as follows: *G. palpalis* occurs in the tropical rain forest from Senegal to Angola on the west coast and thence inland to Uganda and Lake Tanganyika; *G. tachinoides* from Gambia on the west coast to Lake Tchad and through the Cameroons to Fernando Po; *G. morsitans* from the Sudan through Uganda and Tanganyika to southern Rhodesia and Portuguese East Africa. *G. palpalis* and

water hole, in the dry season, where both flies and man congregated.

There are a number of natural enemies of tsetse. In addition to insectivorous birds and lizards, other insects parasitize these pests. Certain mutillid wasps—commonly known in America as "velvet ants"—prey upon the pupae of *Glossina*, and some larval bee flies, family

Bombyliidae, also attack these pupae. Perhaps the encouragement and propagation of these insect enemies, a form of warfare known as biological control, offers the best solution in the long run. Meanwhile the scourge of Africa continues, and the white man enters these vast territories at his peril. ♀ ♀

Tsetse Fly Specimens

Apropos of our current series on African sleeping sickness, General Biological Supply House (Turtos) has a listing in *Turtos News* for October, 1958, that will interest some of our readers. One of their collectors in the Belgian Congo shipped a collection of these flies, with a result that the Company makes the following offers:

- 9X816 *Glossina*, adults in alcohol, each \$1.50, dozen, 15.00.
D6.546 *Glossina*, adult imbedded in plastic, each 5.50
P9.6891 *Glossina*, adult mounted entire on microscope slide, each 3.00
P9.6892 *Glossina*, w.m. of head and mouthparts on microscope slide, each \$1.50
Order direct from the Company at 8200 South Hoyne Ave., Chicago 20, Ill.

USEFUL OPTICAL BARGAINS for NATURE LOVERS

See the Stars, Moon Planets Close Up!
3" Astronomical REFLECTING TELESCOPE
60 to 160 Power - An Unusual Buy!
Famous MT. PALOMAR TYPE



PHOTOGRAPHERS!
Adapt your camera to this Scope for excellent Telephoto shots and fascinating photos of moon!

Assembled - Ready to Use!
You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail, Galaxies!

Equatorial mount with lock on both axes. Aluminized and overcoated 3" diameter high-speed f.10 mirror. Telescope comes equipped with a 50 X eyepiece and a mounted Barlow Lens, giving you 60 to 160 power. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod.

Free with scope: Valuable STAR CHART and 272 page "Astronomy Book."

Stock No. 86,060-AL.....\$29.95 Postpaid

ERECT IMAGE LOW POWER MICROSCOPE 5X, 10X, 20X \$80.00 Value - Only \$19.95



Extremely sturdy with rack and pinion focusing, color corrected optics, turnable microscope body for inclined viewing, three different powers, long working distance under objectives, sufficient eye relief for easy viewing. Made from war surplus optical instrument so that you actually get \$80.00 of value. Weighs 4 lbs., 13" high. 10-DAY

FREE TRIAL! Accessory objectives available for powers of 15X, 30X, 40X.

Stock No. 70,172-AL.....\$19.95 Postpaid



Just Right for Bird Watching
7 x 50 MONOCULAR

This is fine quality, American made instrument - war surplus! Actually 1/2 of U.S. Govt. 7 x 50 Binocular. Used for general observation both day and night, for Bird Watching and to take fascinating telephoto shots. Brand new, \$35 value. Due to Japanese competition we close these out at a bargain price. Directions and mounting hints included.

Stock No. 60,003-AL.....\$15.00 Postpaid



50-150-300 Power MICROSCOPE
Low Price Yet Suitable for Classroom
Use! Only \$14.95
3 Achromatic Objective Lenses on Revolving Turret!

Imported! The color-corrected, cemented chromatic lenses in the objectives give you far superior results to the single lenses found in the microscopes selling for \$9.95! Results are worth the difference! Fine rack and pinion focusing.

Stock No. 70,008-AL.....\$14.95 Postpaid

MOUNTED 500 POWER OBJECTIVE

Threaded for easy attachment on above microscope. Achromatic lenses for fine viewing. 3mm. focal length.

Stock No. 30,197-AL.....\$5.00 Postpaid

Order by Stock No.

Send check or M.O.

Satisfaction Guaranteed

EDMUND SCIENTIFIC CO., - - - BARRINGTON, NEW JERSEY

TAKE PHOTOS of the MOON Through Your Telescope with EDMUND CAMERA HOLDER for TELESCOPES



Bracket attaches permanently to reflecting or refracting telescopes. Removable rod holds camera over eyepiece to take pictures of Moon... or terrestrial telephoto shots of distant objects. White metal projection screen permits you to see the sun spots! Includes brackets, 28 3/4" rod, projection screen, screws, directions.

Order Stock No. 70,162-AL.....\$9.95 Postpaid
(Send Check or M.O. - Money-Back Guarantee)

WAR SURPLUS AMERICAN-MADE



7 x 50 BINOCULARS
Big savings! Brand new! Crystal clear viewing—7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost \$195. Our war surplus price saves you real money.

Stock No. 1533-AL.....only \$55.00 postpd.
(Tax included)

CLOSE OUT! MECHANICAL DRAWING SET Regular Price \$18.00 Our Price Only \$6.00 Postpaid



American mfr. couldn't compete with foreign imports—thus you get a terrific bargain, even far below import prices. 10 handsome pieces in velvet-lined case. Nickel plated brass—precision American-made. We guarantee you'll be satisfied or money refunded.
Stock No. 60,200-AL.....\$6.00 Postpaid
Quantity Price: 5 Sets for \$5.50 each Postpaid
10 Sets for \$5.00 each Postpaid

NEW! 2 IN 1 COMBINATION! POCKET-SIZE 50 POWER MICROSCOPE and 10 POWER TELESCOPE



Useful Telescope and Microscope combined in one amazing, precision instrument. Imported! No larger than a fountain pen. Telescope is 10 Power. Microscope magnifies 50 Times. Sharp focus at any range. Handy for sports, looking at small objects, just plain snooping.
Order Stock No. 30,069-AL, \$4.50 Postpd.
Send Check or M.O.
Satisfaction Guaranteed!

GET OUR BIG FREE CATALOG #AL

We have the world's largest variety of Optical items. Bargains galore... War Surplus - Imported - Domestic! Our stock includes Microscopes, Telescopes, Satellite Scopes, and Spectroscopes, Prisms, Lenses, Recticles, Mirrors and dozens of other hard-to-get Optical items.

Ask for FREE CATALOG #AL

Six-Inch Range Finder

HERE is an excellent and inexpensive range finder for field work, especially in geology and surveying, ecology and photography. It will rapidly determine distances from 8 to 100 feet with an error no greater than two percent, and is small and convenient to carry in the field. Distances from the observer to inaccessible objects are measured with ease. Operation is based upon



The Edmund Range Finder.

the coincidence of two images. One is seen in its natural color and the other in a strongly contrasted gold. When sighting through the eyepiece, both images are seen. By turning the knob the normal image will move either toward or away from the gold image; when the two coincide perfectly, the operator merely reads the distance shown on the dial. Sturdily made and will stand hard usage; comes in a fine leather carrying case. Order direct from Edmund Scientific Co., Barrington, N. Y. \$32.50 postpaid.

Roger Tory Peterson's FIELD GUIDE SERIES

Roger Tory Peterson, originator and editor of the famous Field Guides, has probably taught more people about birds than any other man now living. His classic *A Field Guide to the Birds* has become indispensable to both beginners and experts and is used in every university that teaches ornithology. Other guides under his editorship follow the same system.


The Peterson Field Guide Series has revolutionized identification in the field. These are the basic books for every nature student whatever his specialty. This series has the unqualified endorsement of the American Nature Association.

① A Field Guide to the BIRDS
By Roger Tory Peterson




Universally known as the "Bible of the Ornithologists," Field marks of all birds — song-birds and waterfowl — of the eastern and central states. Called by *Life* "the best of modern bird guides." 1000 illustrations, 500 in full color. **\$3.95**

② A Field Guide to WESTERN BIRDS
By Roger Tory Peterson




The standard western guide using Peterson's unique Field Guide System. 740 illustrations, many in color. **\$3.95**

③ A Field Guide to the SHELLS OF OUR ATLANTIC AND GULF COASTS
By Percy A. Morris




The beachcomber's companion. If casting for channel bass in the surf, bird watching along the shore, swimming, or merely lolling on the beach you will want this one. Over 400 illustrations, 102 in full color. **\$3.95**

④ A Field Guide to the BUTTERFLIES
By Alexander B. Klots



"Unquestionably this is the finest book on American butterflies to be published since 1889." *Vladimir Nabokov, N. Y. Times.* 417 species illustrated, 247 in full color. **\$3.95**

⑤ A Field Guide to the MAMMALS
By William Burt and Richard Grossenheider



Field marks of all species found north of the Mexican boundary. The most extensive collection of color illustrations of American mammals ever published. 187 species illustrated in full color, also drawings and range maps. **\$3.95**

Also by Roger Tory Peterson
Wildlife in Color

A picture book for everyone who loves the outdoors. 450 full color illustrations by eighteen of America's leading wildlife artists, text by Roger Tory Peterson. **\$3.75**

Do you have all these titles on your nature bookshelf? Each shelf-back bears a number identifying it as a Peterson Field Guide. Fill out this coupon and mail today.

AMERICAN NATURE ASSOCIATION
1214 16th St. N.W., Washington 6, D. C.

Please send me:

- 1 A Field Guide to the Birdscopies at **\$3.95 each**
- 2 A Field Guide to Western Birdscopies at **\$3.95 each**
- 3 A Field Guide to the Shellscopies at **\$3.95 each**
- 4 A Field Guide to the Butterfliescopies at **\$3.95 each**
- 5 A Field Guide to the Mammalscopies at **\$3.95 each**
- Wildlife in Colorcopies at **\$3.75 each**

☐ Enclosed is ☐ Send C.O.D.

Name

Address

City Zone..... State.....

HELP US KEEP THE THINGS WORTH KEEPING



UNIVERSITY MICROFILMS
313 N. 1ST ST.
ANN ARBOR, MICH.

FREE

Each of us wants peace for his own precious reasons. But peace costs money. Money for strength to keep the peace. Money for science and education to make peace lasting. And money saved by individuals to keep our economy strong. Each Bond you buy helps provide this money—helps strengthen America's Peace Power. Are you buying enough?

<p>50 HOW YOU CAN REACH YOUR SAVINGS GOAL WITH SERIES E SAVINGS BONDS (in just 2 years, 11 months)</p>			
10	\$2,500	\$5,000	\$10,000
10	\$4.75	\$9.50	\$18.75

HELP STRENGTHEN AMERICA'S PEACE POWER BUY U.S. SAVINGS BONDS

The U.S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, The Advertising Council and this magazine.

